
# NOTE-BOOK

Entomology

Prof. Yuwasa

1926

# 京都帝國大學農學部四明會會則

第一條　本會ハ京都帝國大學農學部四明會ト稱シ會員相互ノ親睦ヲ圖ルヲ以テ目的トス

第二條　本會會員左ノ如シ

一　農學部學生及生徒

二　農學部ニ於テ研究スル大學院學生

三　農學部教授、助教授、講師及助手

四　農學部出身者

五　前項以外ノ農學部職員ニシテ本會ニ加入希望ノ者

六　農學部ニ特別ノ關係ヲ有スル者ニシテ會長ノ推薦ニヨリ役員會ノ議決ヲ經タル者

第三條　本會ニ左ノ役員ヲ置ク

會長一名　幹事二名　委員六名　庶務係一名　會計係一名

第四條　會長ハ學部長之ニ任シ會務ヲ總轄ス

幹事ハ教授及助教授中ヨリ之レヲ互選シ會長ノ事務ヲ補佐ス

委員ハ各學科學生及生徒中ヨリ一名ヲ互選シ會務ヲ掌ル

庶務係及會計係ハ農學部書記之ニ當ル

第五條　幹事及委員ノ任期ハ一ヶ年トシ毎學年ノ終リニ於テ改選スルモノトス

第六條　本會ノ重要ナル役員會ニ於テ選擇之ヲ定ム

第七條　本會ノ會費左ノ如シ

一　教授、助教授及講師ハ一ヶ年金五円トシ其他職員、學生生徒ハ一ヶ年金三円トス

二　學生及生徒ノ會費ハ至急一回ニ分チ毎回金一円宛ヲ授業料ト共ニ本學會計課ニ納ムルモノトス

三　新入會員ハ入會ニ際シ金二円ヲ納ムルモノトス

四　農學部出身者ハ卒業ノ際一時ニ金五円ヲ納付スルモノトス

第八條　會務ハ年一回之ヲ報告スルモノトス

第九條　本會則ハ總會ノ議決ニヨリ之ヲ変更スルコトヲ得

What, where, when, by whom?

Eumicrosoma tenefica.

Pronuba yuccasella.

Ctenocephalus canis.

Bishop 1915. U.S. Dept. Agric. Ent. Bull. 248.

Harms 1912. Arch. Mic. Anat. 80(2).

Riley 1873 Fifth Rept. Ins. Mo.

Riley. Ins. Life. V. p. 161.

Imms. p. 429

McCulloch 1915 Journ. Econ. Ent.

Imms. p. 560

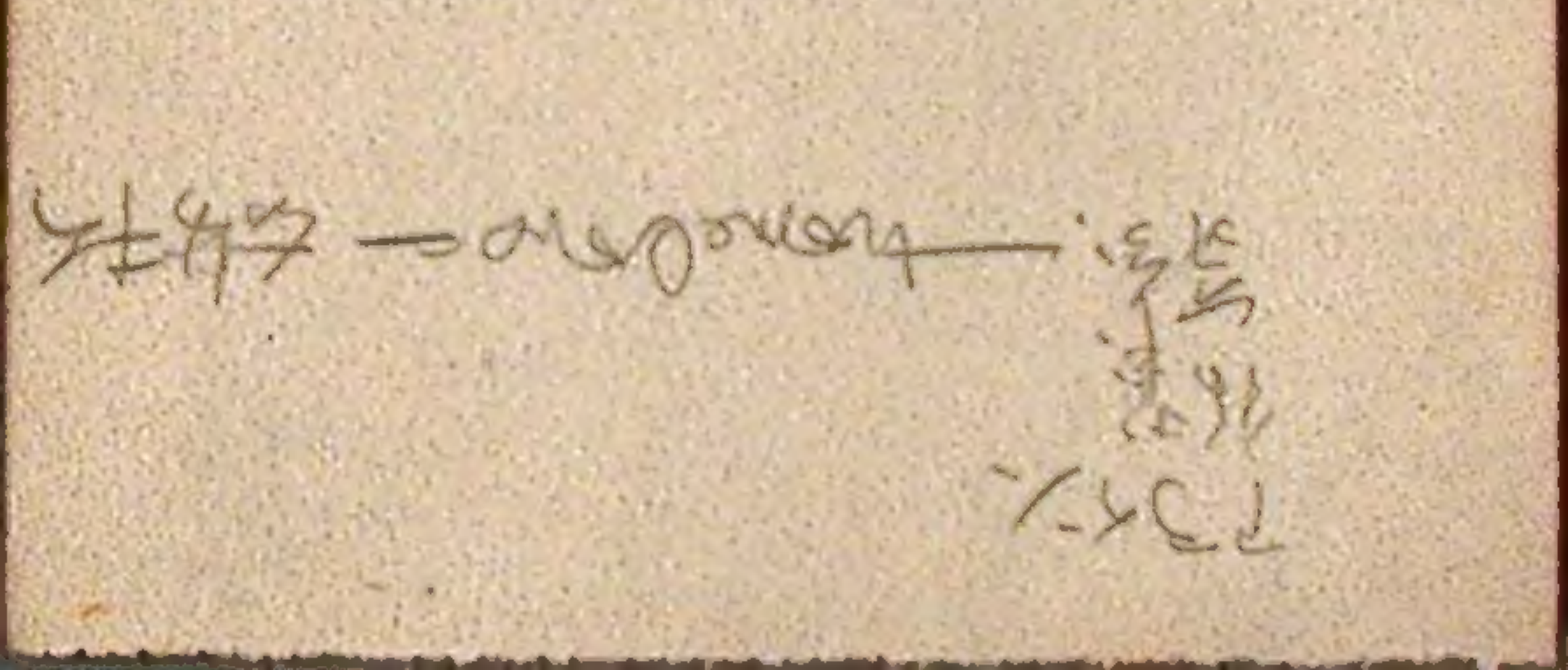
Mouth-part :— Ectognathous, Entognathous
Compound eye :— present or absent.
Abdomen :— 11 segmented
Abdominal appendage :— 7-9, or 8-9
Ocelli :— generally absent.
Leg :— 3 or 4 jointed

Low Hurdle
低欄

High Hurdle
高欄

Broad Jump
幅跳

Javellin
投槍



| | |
|---|---|
| Tabanus. | Tabanidae. |
| Asilus. | Asilidae. |
| | Bombyliidae. |
| | Empididae. |
| | Muscidae. |
| | Dolichopodidae. |
| | Syrphidae. |

- Sialidae
- Raphidiidae
- Mantispidae
  Sisyridae
  Symphrotiidae
  (Hemerobiidae)
  Dilaridae
  Berothidae
  Polystoechotidae
- Chrysopidae
- Myrmeleonidae
- Ascalaphidae
  Coniopterygidae
- Osmylidae

---

- Aeschnidae
- Libellulidae
- Agrionidae.

Collophore
a catch (tenaculum)
spring (furcula)

furcula
collophore
thysanuriform larva
eruciform larva
stylet
vesicle
genitalia
Campodea
Japyx
Machilis

Platyhelminthes — Turbellaria — Planaria.
Mesostoma
Gunda segmentata

— Trematoda

— Cestoda

Acanthocephala

Nematodes — Ascaris

June 3.

DIPTERA (suborder)

Orthorrhapha

Cyclorrhapha.

NEUROPTERA (family)

Sialidae

Raphidiidae

Hemerobiidae

Chrysopidae

Osmylidae

Myrmeleonidae

Ascalaphidae

Odonata (family)

Agrionidae

[illegible]

[illegible]

MARUZEN COMPANY, LTD.
KYOTO

東京市三越百貨店内
丸善株式會社支店
書籍部

大正　年　月　日

| 品名 | 數 | 金額 |
| --- | --- | --- |
| | | |
| 計 | | |

上記之通御受領也

# PHYLUM ARTHROPODA.

| | class | habitat | respiration, by means of. | body forms | body segmentation | antennae | legs | reproductive orifice |
|---|---|---|---|---|---|---|---|---|
| most primitive | Onychophora | terrestrial, in damp situations | tubular trachea | cylindrical | unsegmented (externally) | one pair | numerous (not jointed) | near the hind end of the body |
| aquatic series | Crustacea | in the fresh & salt water (some in damp places on land) | true gill (some, cutaneous) | variable | distinct (often forming cephalothorax) | two pairs | at least five pairs | uncertain, as a rule far forward |
| | Palaeostraca | marine | true gill | 'kabuto' shape (?) | distinct (forming cephalothorax) | apparently without | ? distinct | near to base of the abdomen |
| aquatic offshoot | Arachnida | terrestrial, secondarily | tracheal, by book-lung or tubular trachea. | variable | distinct, separate into cephalothorax & abdomen (except Solpugida) | apparently without, modified as jaw | four pairs | near the base of the abdomen |
| degenerate arthropoda of doubtful position | Pycnogonida | aquatic (marine) | no distinct organs | arachnid-like | distinct, cephalothorax & abdomen, the latter reduced, no segmentation | ? | typically seven pairs of appendages, in which one pair of the ovigerous legs & fifth pairs ambulatory | through the second segment of the legs |
| | Tardigrada | in fresh or salt water, but most of them in damp places | variable, no distinct organs | microscopic bear shape (?) in wet condition like a grain of sand in dry condition | distinct | without | four pairs (unjointed) | into the intestine |
| | Pentastomida | parasitic | no distinct organs | worm-like | ? distinct. | without | degenerate, larva with two pairs | male: a short distance behind the mouth. female: near the caudal end of the body |
| primary aerial series | Diplopoda | in damp situations | ? trachea | usually cylindrical | distinct, continuous (head distinct) | short, very similar to the legs | numerous | behind the second pair of legs |
| | Pauropoda | in damp situations | ? unknown | centipede-like (including wide form) | distinct, continuous (head distinct) | branched | numerous | in the third segment back of the head |
| | Chilopoda | in damp situations | trachea | long & flattened | distinct, continuous (head distinct) | long, many jointed | numerous | in the next to the last segment of the body |
| | Symphyla | in earth and other damp situations | trachea | elongate | distinct, continuous (head distinct) | very long, many jointed | numerous | in the third segment ~~to~~ behind the head |
| | Myriapoda | in damp situations | trachea (or without distinct organs) | elongate fusiform | distinct, continuous | absent | three pairs in thorax, three (vestigial) pairs in abdomen | near the hind end of the body |
| | Hexapoda | variable (aquatic; almost fresh water) | trachea (aquatic; tracheal gills or blood gills) | variable | distinct, separate into head, thorax & abdomen | one pair, form variable | three pairs on thorax | near the caudal end of the body |

1925-5-8 Kinji Imanishi

| | |
|---|---|
| digestive organs axial | reproductive organs |
| segmentally arranged ganglion | |
| and paired commissure. | paired |
| | paired or single |
| without sympathetic ganglion | paired ovary ventral. |
| | usually simple |
| two ganglion in one segment | " |
| | " |
| segmentally ganglion | paired. |
| but cephalization | |

| | | | |
|---|---|---|---|
| Branchiopoda | Lipobranchia | Branchipus | |
| | Cladocera | Daphnia | |
| Ostracoda | | | |
| Copepoda | Eucopepoda | Cyclops | |
| | Branchiura | Argulus | |
| Cirripedia | Eucirripedia | Balanus | |
| | | Pollicipes | |
| | Rhizocephala | Sacculina | |
| Malacostraca | Peracarida | Mysidacea | Mysis |
| | | Cumacea | |
| | | Tanaidacea | |
| | | Isopoda | Porcellio |
| | | Amphipoda | |
| | Eucarida | Decapoda | |

Peripatus
Buthus
Prochordata
Hemichorda
Urochorda
Balanoglossus
Teymavia
Tunicata
Endostyle.

# Scolopendrella ノ Insectean 及 Millipedean affinity ニ就キテ

**Scolopendrella ノ分類上ノ position** Comstock ニヨレバ Phylum Arthropoda ノ one class ニ Symphyla ヲ置キ Symphyla ヲ Diplopoda (millipeds), Hexapoda (Insecta) etc ト共ニ ~~primitive~~ primarily aerial ナル group ニ入ル。Folsom ニヨレバ Symphyla ヲ一ツノ class ニシテ ~~[illegible]~~ Myriapoda ナル class ノ下ニ Symphyla, Diplopoda 及 Chilopoda ト共ニ Order ニシテ取扱ハレタリトスル (Sedgwick). 又 Parker 及 Haswell ハ Myriapoda ナル名ヲ用ヰズシテ Symphyla ト Diplopoda ヲ sub-class Progoneata ニ入レ、Chilopoda ヲ sub-class Chilognathata ニ分ツ

**Symphyla ト Diplopoda** 扨 Symphyla ト Diplopoda トノ間ノ affinity ハ如何ニ密接ナリヤ。(特ニ Symphyla ガ Hexapoda ニ近ヒヤ) 次ニ両者ノ間ニ無数ニ多クアル External structure ニ於ケル異点ヲ挙ゲテ見ルコトニスル

| | | Symphyla | Diplopoda |
|---|---|---|---|
| 1. | body form. | cylindrical. | more or less flattened. |
| 2 | exoskeleton. | without chalky matter. | containing chalky matter. |
| 3. | head. | with a Y-shaped epicranial suture. | ~~[illegible]~~ a Y-shaped epicranial suture. |
| 4. appendages. | antennae. | long, many jointed. | short, very similar to the legs. |
| | mouthpart (consist of) | a pair of mandibles; maxillae and maxillae: labium. | labrum: a pair of mandibles and a compound plate. |
| | legs | most segments bear a pair of legs (and most leg a parapodium. | most segments bears two pairs of legs each |

**Symphyla ト Hexapoda** Symphyla ニハ Scolopendrella ノ外ニ Scutigerella ナル one genus ガアルノミナリ。其ハ very small arthropods デアルカラ Koch (1847) ノ如キニハ未ダ記載サレテヰナカッタ。而シテ Scolopendrella ガ特殊ナル Insecta ノ Thysanuridae ニ非常ニ似テヰルノデ Grassi ハコレガ Myriapoda (Chilopoda ヲ除ク) ノ ancestor デアルト考ヘタ。* 外見ニハ Class 特有ノ adult ニ於ケル feature ヲ欠ク点ヲ以テ Arthropoda ノ monophyletic origin ヲ信ジ難イ点ガ多イガ、Insecta ニ於テハ Symphyla ニ於テ Thysanura ニ於ケル primitive ナル点ガ degenerate シテヰルカラ、恐ラク之ハ convergence ヲ示スモノデアラウ。**

**Scolopendrella ト Campodea** 今 Scolopendrella ヲ Thysanura ノ Campodea ト比較スルニ次ノ如キ類似点ヲ認メル

1 elongate body form
2 distinct head which has a Y-shaped epicranial suture
3 one pairs of long antennae.
4 [illegible]

* 既ニ述ベタ如ク Scolopendrella ハ Insecta ノ ancestor ニ近イ形デアル

** 一方 Scolopendrella ハ Tracheae ノ independent origin ヲ主張スルモノデアル

5. wings absent
6. jointed legs.
7. very thin integument.
8. epithelium of the mid-gut being histologically equal.

2 共通ノ特徴

~~1. broad plate~~

| | Scolopendrella | Campodea |
|---|---|---|
| 1. | broad plate covering the whole back of body. | abdomen not covered. |
| 2. | thorax not developed. | more or less distinct. |
| 3. | with twelve pairs of legs. | three pairs of legs. |
| 4. | breathe by means of a single pair of stigmata on the under surface of the head. | three stigmata in the anterior part of the body. |
| 5. | nervous system, want of sympathetic ganglia. | with sympathetic ganglia. |
| 6. | genital gland, ventral | dorsal |
| 7. | reproductive orifice, in the ~~fourth~~ third segment behind the ~~H~~ head (after Comstock). | near the caudal end of the body. |

Sedwick ハ 尾ノ末端 = terminal appendage ト 及 Scolopendrella ノ 第一 sense organ ノ Campodea ニ 欠ケテヰル. 又 = parapodia ハ machilis ニ於ケル styli ニ ~~homo~~ homologous デアリ caudal appendage ハ Insecta ノ cerci ニ 相当シ 又 Scolopendrella ハ genealogical ニ 上ニ述ベタヤウニ 其 祖先ガ 完全ニ 其 形態ヲ 具ヘタ genus デアルコトヲ示ス.*

May. 11. 1926.

Kinji Imanishi

* genital opening ハ diplopoda デハ double デ scolopendrella 及 Insecta ハ simple デアル. 然ルニ Thysanura ニハ double opening ガ 同ジ位置ニ 開ケテヰル.

Swammerdam

alary system

Hagen. Bibliotheca Entomologica

Lyonet

Fabricius Entomologia systematica, maxillary system

Latreille

electric system

genealogical tree

Linnaean law

Quatrefages Geoffroy Theory

hypopharynx

Blackman

polyphyletic origin

Archiannelida — polygordius.

| | class | sub-Class | genus |
|---|---|---|---|
| Annelida — | Chaitopoda — | Polychaeta — | Nereis. |
| | | Oligochaeta — | Lumbricus. |
| | — Hirudinea | | — Hirudo. |
| | | order | |
| | Arachnida — | Scorpionida — | Buthus. |
| | | — Pseudoscorpionida — | Chelifer. |
| | | — Pedipalpida — | [illegible] (scorpion-spider) |
| | | — Solpugida | |
| | | — Phalangida — | [illegible] (harvestman) |
| | | — Araneida | — (spider) |
| | | — Acarina | — (mite) |

Protarthropoda < Procrustaracheon
Protentomon

Progenerata — Diplopoda, Pauropoda, Symphyla
Dorsonomata — chilopoda, Hexapoda

Moseley
Newport
Kingsley
Grassi — Scolopendrella.

# PHYLOGENY

Apr. 20

# Introduction

8 period = 生物学史ヲ分ツ

1. altemp. アリストートル以前 (321 BC)

アリストートルハ Kentrons ヲ区別セリ. i.e. 有ヲ3 teil ニ分ツ

又 [illegible] ニツキ 2 cicada ハ musical organ ニツイテ記述セリ.

後ハ Mondteile ヤ Flugel 等ヲ区別シテ記述セリ. i.e.

A. pterota vel Ptilota

1. Coleoptera (=col)
2. Pedilica (= orth. saltatoria)
3. Asthmatic (= Hemib)
4. Psychae (= Lepid)
5. Tetraptera
   (1) ~~neg~~ macrora (= neurop. + orth.)
   (2) opisthocentra (= Hym ~~except~~ except Formica)
6. Diptera (= Dip)

B. ?. pterota simul et aptera
   (1) myrmex (= Formicidae)
   (2) pygolampis (= Lampyris)

C. Aptera

: [illegible] Genus (Gulliver) [illegible]

[illegible]

[illegible] 1758.

13-17 [illegible] 時代

Pliny [illegible] 博物誌 [illegible] 当時の idea [illegible]

Thomas de Cantimpré (1201-1263?) [illegible] Hoj [illegible]

Albertus Magnus (1193-1280) [illegible] 系統的 [illegible]

[illegible] (1232-1300) [illegible] biology [illegible]

[illegible] (1250) [illegible] Schatzbuch [illegible]

[illegible] 'Theatrum Insectorum' [illegible]

[illegible] 時代 17-18世紀.

Swammerdam [illegible] 実験研究の [illegible]

Ray [illegible] system [illegible] biology [illegible]

[illegible]

Leeuwenhoek (1632-1723) 和蘭

[illegible] 顕微鏡 [illegible] 昆虫組織 [illegible]

[illegible] 研究 [illegible]

J. Sperling (1661). 昆虫 [illegible] guide book, distribution [illegible]

Linnean period 18世. (Die Zeit Linnés)

Carl Linnaeus, 後 Carl von Linné (1707-1778) が [illegible]

[illegible] 系統 [illegible] 基礎 [illegible]

[illegible] 分類 [illegible] 表記 [illegible] 学名 [illegible]

[illegible] species [illegible] 正確 [illegible]

[illegible] Linné の genus [illegible] 50 [illegible] family [illegible]

[illegible] 60 genus [illegible] 7 [illegible] order [illegible]

Systema Naturae 1735. [illegible]

[illegible] Neurop. Lep. Hym. Dip. [illegible]

[illegible] Lepidoptera, Neuroptera, Hymenoptera, Diptera, Coleoptera, Hemiptera, Aptera (Apterous) [illegible] System [illegible]

[illegible] system と [illegible]

Hertig: L. der Zool.

Schröder: IV Aufl.

○ A Hagen: Bibliotheca Entomologica bis 1862.

三宅: [illegible]

○ [illegible] Aristotle [illegible]

1 [illegible] biology [illegible]
2 [illegible] posit

Apr. 27

Systema Naturae
1–12 Ed. 1735–1768
10 Ed. 1758
13 Ed. posthumous 1788–1793.

René Antoine Ferchault de Réaumur 1683–1757.
Memoires pour servir à l'histoire des insectes 7 vols. 1734–1742 Paris

Carl De Geer. 1720–1778
[illegible] 7 vols. 1752–1778 stockholm biology [illegible].
Insect 7 14 order (7 class) = [illegible]

Pieter Lyonet 1707–1789 Hollander.
Traite anatomique de la chenille qui ronge le bois de Saule. 1760
[illegible] anatomy ([illegible]) [illegible] [illegible]
[illegible]. [illegible] [illegible] [illegible]

15世紀中頃—19世紀
Postlinnean period [illegible] Linné [illegible] systematic
[illegible]

Johann Christian Fabricius 1745–1808. [illegible]
maxillae. labium. antennae [illegible] Linne [illegible]
[illegible] order [illegible] is maxillary system, [illegible]

1. Coleoptera = Col
2. Ulonata = Ortho. +
3. Synistata = Plec, aptera, Hym. [illegible]
4. Agonata = scorpion. Crustacea (p.p.)[2]
5. Unogata = Odonata. myriopoda, spid. v.
6. Glossata = Lep
7. Rhyngota = Hem. siphon thysan.
8. Antliata = Dip. Inail Anop

UND0025

[illegible] system と maxillary system [illegible]

次に Systema entomologiae 1775 を出版する。

Entomologia systematica 4 vols 1792—1794 を出版した。

後に 1790 に Hymenoptera を Synistata と Aculeata と Piezata と

2 Odonata とわけた。後の order の中に Heteroptera と Piezata は

明瞭な subgroup だ。

Pierre André Latreille 1762—1833.

Fabricius の昆虫の研究法に、分類法の基礎を [illegible]

昆虫学者は Latreille の時代の genera の中に代表的な species を

取って、genus の type species とした。[illegible] genera の definition [illegible]

[illegible] 以前の Linné の class system と Fabricius の maxillary

system とを [illegible] ~~Histoire nat. système~~ [illegible]

Histoire naturelle, générale et particulière des Crustacés et des Insectes. 14 vols. 1802—1805.

System の現代の [illegible]

| | | | |
|---|---|---|---|
| 1. | Col. | 7. | Dip. |
| 2. | Orth. | 8. | Suceurs (fleas) |
| 3. | Hem. | 9. | Thysanoures |
| 4. | Neur. | 10. | Parasites |
| 5. | Hym. | 11. | Acephales (mites) |
| 6. | Lep. | 12. | Entomostracés |
| | | 13. | Crustacés |
| | | 14 | Myriapodes. |

UND0026

Jean Baptiste Pierre Antoine de Monet chevallier de Lamarck
1744–1829.

著書: Système des animaux sans vertèbres . . . . 1801.

彼は species は fix シテイルモノデアルと云フ当時ノ説ニ反対シテ 種ノ説ヲ唱ヘタ。彼ノ著書ハ 自然界ニ存在スル species は mutable ナリト叫ブ。換言セバ 彼ハ species ノ源ヲ 自然界ニ存在スル individual ノ中ニ求メタノデアル。

Georg Leopold Christian Dagobert Cuvier. 1769–1832.

彼ハ動物ノ各部ハ他ノ部ニ対シテ相関関係ヲ有スルモノデアルト考ヘ 動物ハ多クノ stimuli ノ影響ヲ受ケテ生ジタモノデアルト考ヘタ。彼ノ著ハ英訳シテ Ed. Griffith 1832–35 ニ The animal kingdom arranged in conformity with its organization by the Baron Cuvier

彼ノ分類. Cuvier ノ分類.

| | | | |
|---|---|---|---|
| 1 | Myriapoda | 8. | Neurop. |
| 2 | Thysanura | 9 | Hym. |
| 3 | Parasitica | 10. | Lep. |
| 4 | Suctoria | 11. | Rhipiptera |
| 5 | Col. | 12 | Dip. |
| 6 | Orth. | | |
| 7 | Hem. | | |

i.e. Crustacea ノ Insecta ニ対スル group ノ関係ハ [illegible]

William Elford Leach —1836

著書: The Zoological Miscellany 3 vols. 1814–17.
Entomology in Brewster's Edinburgh Encyclopedia Vol. 9 pt. 1 1815

i.e. Insect ノ popularization ニ対シテ 彼ハ Crustacea ノ [illegible]

当時ハ哲学ノ黄金時代ニシテ 種々ノ分類ヲ fancy ヲサカンニ行ハレタリ

Carl Gustav Carus 1789—

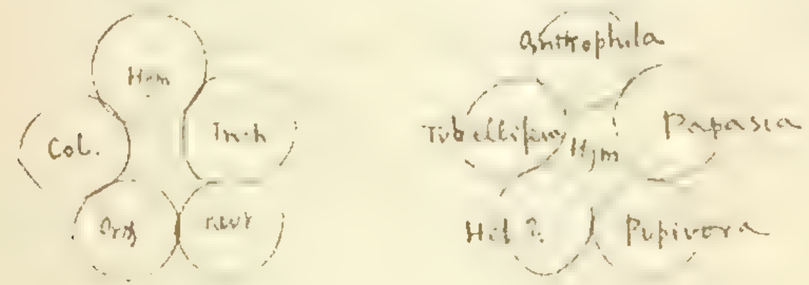
Uebersicht des gesammten Tierreichs 1820.

動物界ノ美化ヲ目的トシテ 宇宙的ナ system ヲ拵ヘタルモノ

William Sharp Macleay (英)

Horae Entomologicae 1 vol. pt. 1 2. 1819—21

'Quinary system' i.e. 昆虫ヲ五ツノ group ニ分ク i.e. Mandibulata




mandibolata

Haustellata ニ対シ ソノ名ヲ与ヘ 之ニ五ツノ order ニ分チ 其中ニ 昆虫ノ殆ンド凡テ含マレタリ

19世紀ニ入リ entomology ニ於テ monograph 及 text book ノ編成セラレタル

William Kirby 1759—1850 and William Spence —1860

An introduction to entomology. 4 vols. 1815—26.

第四巻ノ一部ト 第五巻ノ殆ンド全部ハ 19世紀ニ於ケル最モ有名ナル chapter ナリ classic ナリ

1 44
2. 英.

Hermann Carl Conrad Burmeister. 1807—1861.
Handbuch der Entomologie. 4 vols. 1832—1855
内容は分類関係のみ

John Obadiah Westwood. 1805—1892
An introduction to the modern classification of insects, founded on the natural habit and corresponding organization of the different families. 2 vols. 1839—1840.
この時の分類 larva ~~larva~~ 及び larva の注意は特に coleoptera の larva の研究, 内容は分類のみ 以下参照

1. Col. Autotte ~~Autotto~~
2. Euplexoptera Westw.
3. Orth. Olivier[1]
4. Thysan. Haliday[2]
5. Neur. L
6. Trich. Kirby
7. Hym. L.
8. Strepsiptera Kirby
9. Lep. L.
10. Homoptera Westw.
11. Heteroptera Westw.
12. Aphaniptera Kirby
13. Dip. Aristotle.

[1] Latreille の分類は 1819 年の分類 — 1st period in entomology
[2] 1841 年 transition days の分類 [illegible]

## Darwinian period

Charles Darwin 1809 — 1882.

On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life. 1859.

species question について 再び 考えれば, form が 何を genetically に 決めるか の 決定 の cardinal standard として 扱 ったが, C. Darwin の 業績 は, 生物 の 変化 を mimicry, adaptation に 研究 — 又 地理的分布 や, 地質的分布 の 研究 を 起 し, 異種学 の 分野 を 拡げた のである

## Post Darwinian period

1901年 から 2001年. phylogeny の 研究 genealogical Tree が Darwin の 考えから stimulus を 受け 出 た. 又 分類学 の 方 から 又 は 古生物学 の 方 specialization を 起 した 結果 の 結果 の 結 今日 の 学 へ 入 へ

Mar 8.

phylogeny ノ系統

phylogeny ノ系統ハ homology ニ anatomical equivalent ニアルコトヲ意味シ analogy ハ physiological equivalent ニアルコトヲ意味シ

ナレトモ場合ニ homology ノ存在ヲ証明シ難キ時ニ homology ニヨリテ決定ヲ下ス

Arthropoda ノ系統

脊索 cotton ノ bilateral symmetry, segment appendage, linear sequence, chitinous exoskeleton, circulatory system dorsal, alimentary canal axial, nervous system ventral paired ganglion.

Arthropoda ノ分類 1. Crustacea 2. Onycophora (or Malacopoda or Protostracheata) 3. Myriapoda 4. Hexapoda 5. Arachnida.

Sharp ノ分類

Grade A. Diagnosis. Hyparthropoda

" B. Proarthropoda, Onycophora .... peripatus

" C. Diplopoda, Arachnida, Crustacea, Chilopoda, Hexapoda

Incertae sedis* Tardigrada, Pentastomida

is hyparthropoda, proarthropoda etc genealogical ノ意味ニアラズ

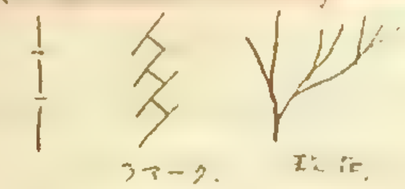
Constitute ヲ使フ group ノ意味ニ使フ = 過ギズ分類法ノ一ツナル

'Introduction to Entomology' ノ p.2-3.

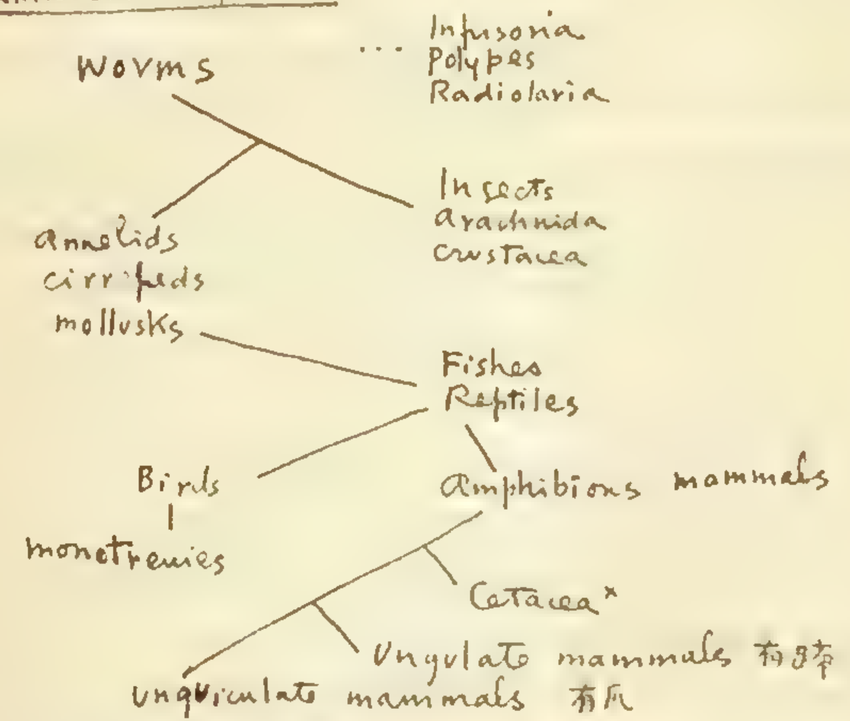
* 位置不明



コレラノ分類ガ皆ノ linear arrangement ヲ作サントシテ示ス.




Lamarck ニヨル系統樹



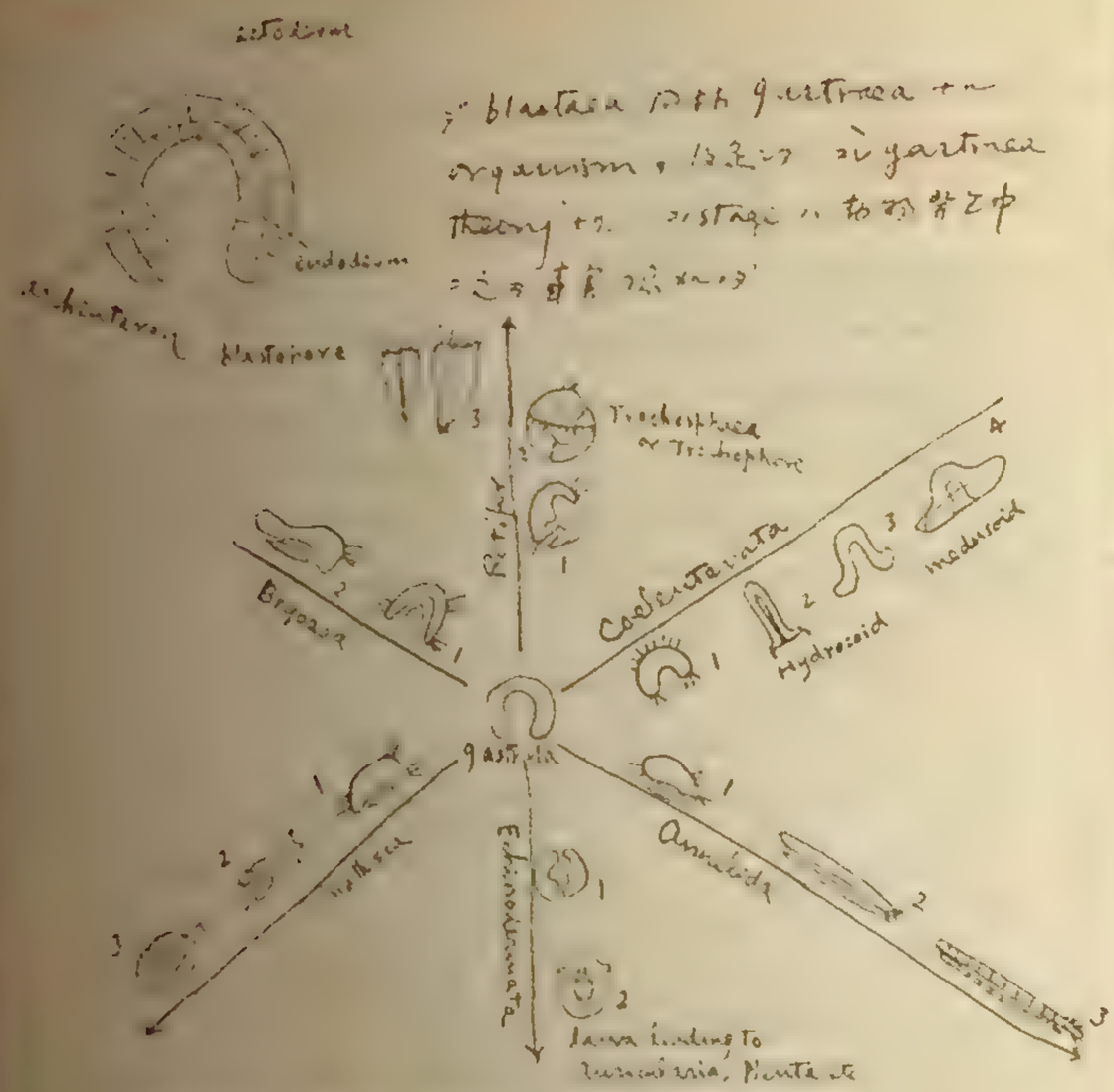

Haeckel ノ gastraea theory

彼ノ biogenetische Grundgesetz. (biogenetic law) — Ontogeny recapitulates phylogeny.

卵ノ場合ヲ例ニ取ルニ卵細胞ノ最初ニナイ状態 Blastula ヲ経テ 色々ノ段階ヲ経テ

'Blastula stage' ヲ経過ス. コレニ次イデ gastrula [redacted] ノ stage ヲ

* whales



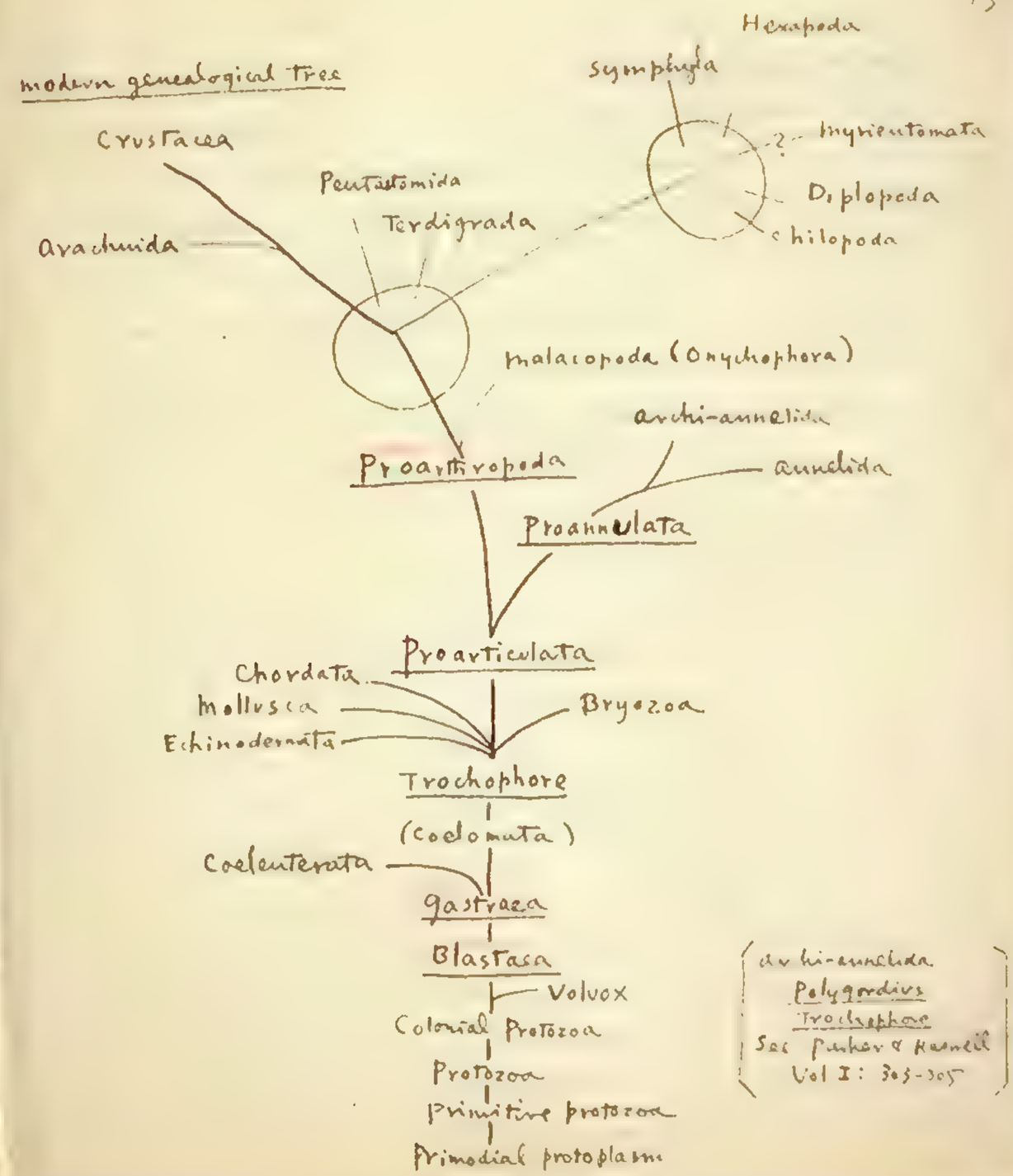

number show the corresponding stages.

[illegible] gastrula stage [illegible] Arthropoda & Annelida /

Stem: [illegible] gastrula [illegible]

[illegible] genealogical tree [illegible] Arthropoda, Annelidan [illegible]





polyphyletic origin [redacted] 所説ニ反スル same origin ニ arthropoda ノ classes ノ等ハ多ク polyphyletic ナリト主張スルモノニ Packard, Kingsley ハ Packard ノ 'Textbook of Entomology' ヲ見ルベシ.

Müller's crustacean theory crustacea ハ他ノ甲殻類ト異ナリ arthropoda ノ origin ヲ示ス crustacea ト之ニ近イ arthropoda ノ祖先トノ比較ノ為ニ embryonic development ヲ多ク ~~crustacea~~ arthropoda ニ Lamphrys ノ form ヲ採用シタリ

ハ之ヲ以テ arthropoda ハ monophyletic ~~origin~~ group ナルコトヲ知ル.

Scolopendrella

| | Annelida | Onychophora | Crustacea | Symphyla | Arachnida | Diplopoda | Chilopoda | Hexapoda. |
|---|---|---|---|---|---|---|---|---|
| symmetry | bilateral | " | " | " | | " | " | " |
| Integument | non-chitinous | delicate | chitinous | no chitinous | chitinous | " | " | " |
| segmentation | metamered | unsegmented externally | segmented | " | abdomen segmented | segmentation doubtful | segmented | " |
| body regions. | no differentiation | head & body | cephalothorax & abdomen | head & body | cephalothorax & abdomen | head & body | head & body | head, thorax & abdomen |
| no. of appendages (legs) | numerous | " | " | many | four pairs | 2 pairs in each segment | 1 pair in one segment | 3 pairs |
| location | on most segment | segmentally arranged | cephalothorax & abdomen | most body segment | on cephalothorax | body segm. | " | Thorax |
| kind | unsegmented setae-like | imperfect segmented fairly | segm. fairly, typically biramous | segm. fairly | " | segm. 1 pair short | segm. 1 pair long | segm. fairly |
| antennae | no antennae | a pair | 2 pair | a pair | " | " | " | " |
| eyes | none or wanting | simple eye | paired, compound | | simple | " | " | both simple & compound |
| mouth parts | primitive jaw: fleshy lip | 1 pair of mandi. 1 pair of oral papillae | 1 p. of mandi. 2 ps. maxillae 3 ps maxilliped | labrum 1 p. mandi 2 p. maxillae | mandible maxillae | 1 p. mandi. compound & plate | 2 p. mandi. | typically 3 pairs. |
| genital opening | fairly | single | usually fairly | single | " | " | " | single but Thysanura fairly |
| respiratory system | branchial or cutaneous | tracheal (tubular) | branchial or cutaneous | Tracheal | tracheal (tubular or both) leaf or both | primitive Tracheal | tracheal | " |
| excretory system | nephridia, ~~segmental~~ symmetrically arranged in segm. | nephridia, segmentally arranged | nephridia | malpighian tube | " | " | " | " (except Thysanura) |
| nervous system | ventral ganglion segm. arranged | nerve cord ~~divided~~ divided ganglion segmentally. | ganglion segmentally | ganglion segm. non sympathetic ganglion | 2 gangl. in each segment | segmentally ganglion | " | segmentally ganglion with exception |
| digestive tract | axial | " | " | " | " | " | " | " |
| reproductive gland | usually paired | paired | paired or single | paired, ovary ventrally arranged | usually single, rarely paired | usually compound | usually single. | paired. |

× Burmeister
×× Comstock p.155 'Naupliform'

May, 11.

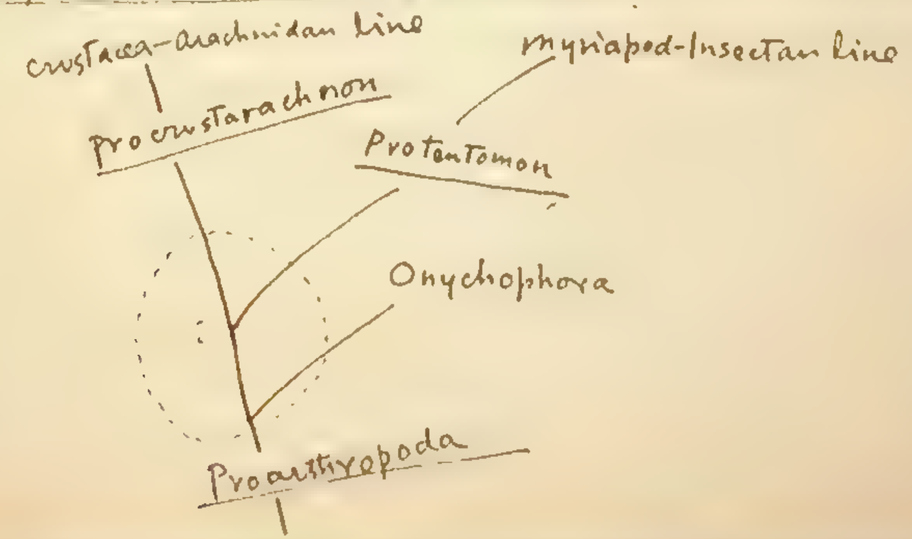
annelida + Arthropoda

Canada ノ Cambrium formation ニ見出サレタル marine ナル Polychaeta ノ one Genus — Aysheaia ハ之ニ比定サレタリ. (Walcott)
之ハ primitive ナ proarthropoda ノ姿ナルベシト云フ.
crustacean development ニ於テ zoea stage ハ insect ニ比スベシ.
之ハ crustacean origin ノ人生ノ上ニ於テモ同ジナリ.[××]

peripatus ガ annelida ト arthropoda ノ間ニ位スルモノトセラレタルハ一説ニ. 1825 ニ発見, 初メ mollusca ニ入レ, 後 annelida ニ入レタリ (1851). ゴルドスチュタイン[×] ハ '56 annelida ト arthropoda ノ中間ノモノト云ヒ, '74 ニ ~~Moseley~~ Moseley ハ i.e. Trachea ヲ有スル所ノ relation ~~ship~~ ヲ annelida-arthropoda ring ヲ以テ示ス.

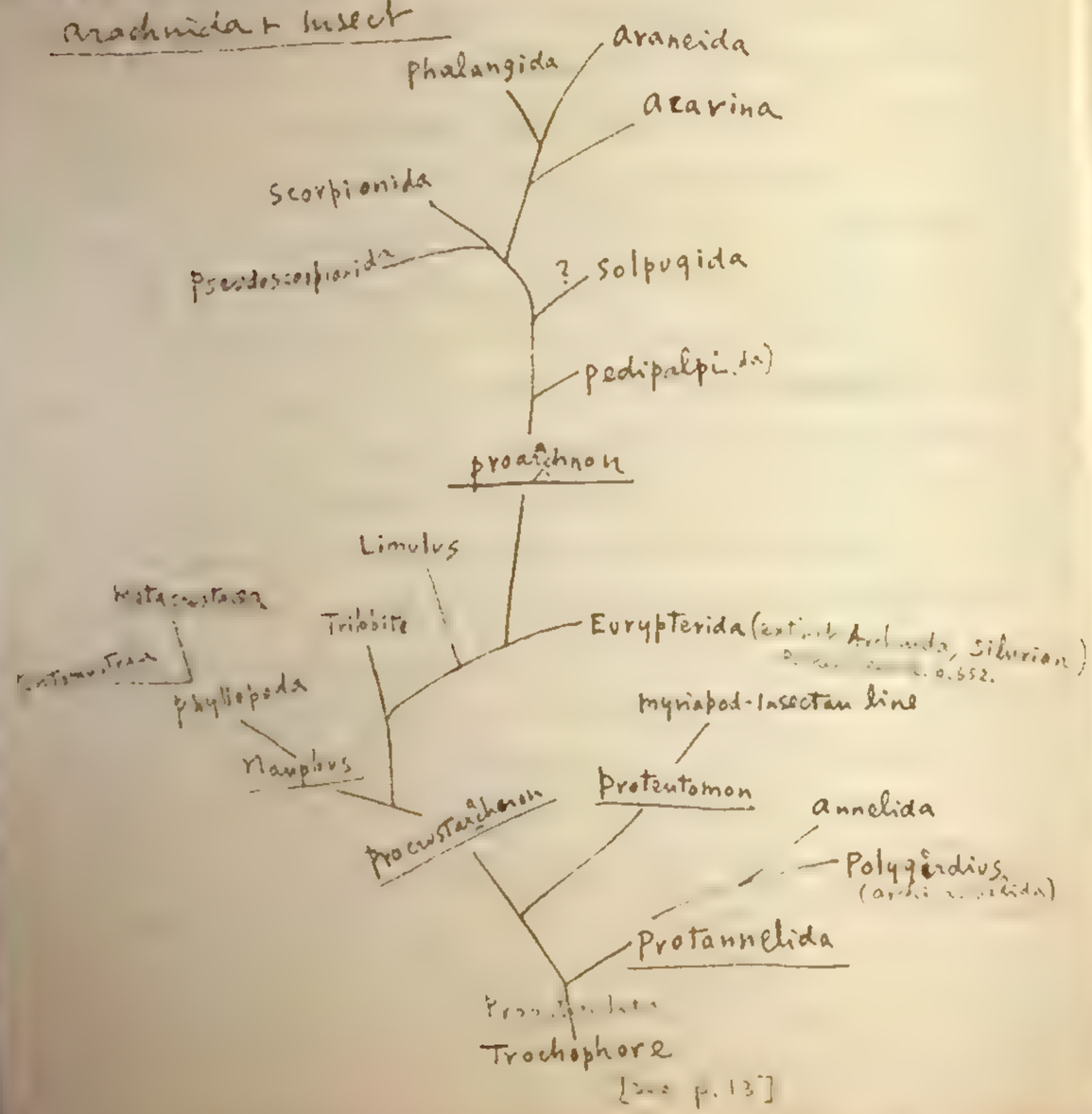
see Daiber. in Lang's Hdb. d. morphologie Bd. IV. :351–372.
Sedgwick. in Cambridge Natural History Vol.5. 3–26.

peripatus ノ如ク class ニ於テ affinity



Protentomon 1876. P. Mayer が示唆した様に、現在の adult insect の様子から、殆ど迄の形態を推定した。

Arachnida と Insect




[see p. 13]



i.e. Limulus, Trilobite ~~Acaro~~ ノ如ク crustacean (branchial) ト比較スルモノ respiratory organ ヲ分類ノ標準トシテ代表的ニ用ヒテ行フ (Lang, Handbuch)

Articulata

Arthropoda

I. Subphylum — Arthropoda branchiata

1. Hauptklasse — Eubranchiata

I. Klasse — Trilobita

II. Klasse — Crustacea

2. Hauptklasse — Merostomata

II. Subphylum — Arthropoda pulmonata

III. Klasse — Arachnoidea

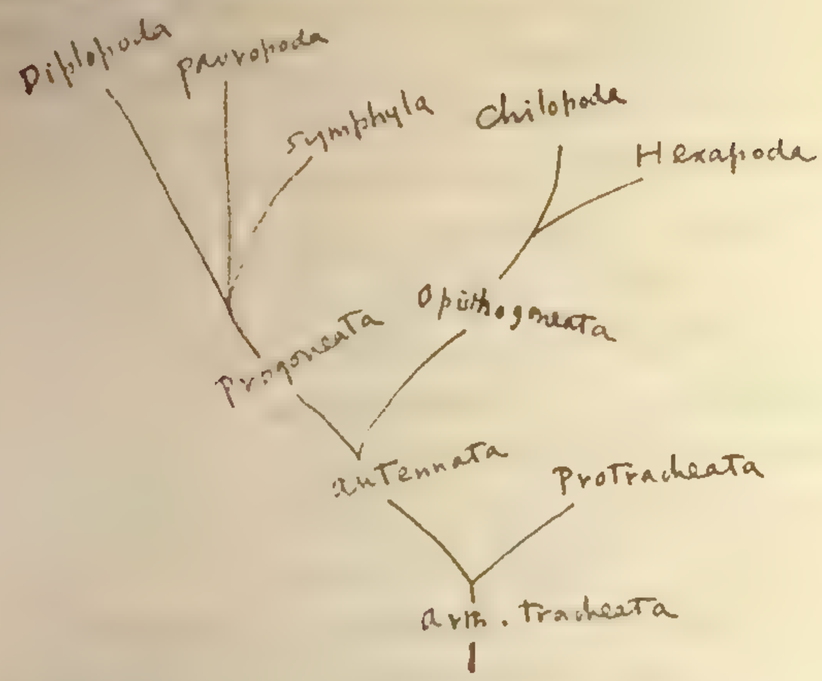
III. subphylum — Arthropoda Tracheata.

IV. Klasse — Protracheata (= Onychophora)

V. Klasse — Antennata (= Myriapoda et Hexapoda)

1. Progoneata
   1) Diplopoda
   2) Pauropoda
   3) Symphyla
2. Opisthogoneata
   1) Chilopoda
   2) Hexapoda.

## Arthropoda Tracheata




## old division 'Myriapoda'

[illegible] ノ時代ニ Diplopoda ト Chilopoda ト [illegible] Insecta apterа ニ [illegible]. 1844 ニ Newport ハ [illegible] ト Hexapoda ヲ [illegible] Kingsley ガ更ニ Miriapoda ヲ [illegible] ノ history ヲ [illegible] many segmented, many legs [illegible].

Hexapoda–Chilopoda affinity ハ今日認メラレテイルニモ拘ラズ Symphyla–Hexapoda affinity ノ如キハ [illegible]. Symphyla ヲ Hexapoda ancestor ト考ヘタ人ハ Packard, Kingsley, Grassi



Haase [illegible] 等ガ. 之ニ対スル人ハ曰ク. [illegible] Tracheal ニ [illegible] ト. Trachea ハ一ツノ adaptation ト云フ. 勿論此ノ選擇ニ [illegible] 原因ト [illegible] (Trachea ノ independent origin ナル)

## 昆虫 order / phylogeny

Criteria

1. metamorphosis / 有無及 程度
2. wings. 有無及 發育程度. 退化
3. metamerism. 分節程度. segment / 変化特徴
4. 口器・脚等. 特殊化.
5. acceleration of development. stage.
6. Acquired habit. (水棲昆虫 / 寄生等).
7. Instinct and society formation.

× 1.2.3.4 Collembola / 項ヒテ原始的ニ云ハレタモノデ
×× 三宅 二巻 p.207.

May, 18

**primitive Insect**. thysanura[×] segment / 多 antennae, anal cerci, development, abdomen ten segments, rudimentary leg. collembora ハ ソレニ cerci reduce, abdominal segment 6, furcula, collophore ナド特殊 / organ 有ルカラ. 特殊ス. i.e. Thysanura ハ collembora ニ比シ more primitive ナリ.

i.e. thysanura ハ

i. rudimentary leg. ii embryonary second antennae. iii absence of wing iv absence of metamorphosis v. metamerism / specialization 低シ. vi thorax ト abdomen / 区別著シカラズ vii 腹面神経索 / double origin (癒合セズニ別ナリ) viii digestive organ, simple viii integument, thin ix thysanura / 幼生ニ多クノ昆虫ニ見ル (thysanuriform larva) i.e. orthoptera, plecoptera, ephemerida, odonata, ラ社 / neuroptera ト coleoptera. higher order / insect ニハ thysanuriform / 代リニ eruciform larva[××] (毛虫ナド) ヲ見ル. コレ特ニ more primitive ト one evidence デアル. 又: hypermetamorphosis ヲナス Meloid, Mantispa ナドデ幼生ガ成虫ノ先ニアラハレテ之ヲ証ス.

**rudimentary abdominal appendage** ト / phylogenetical significance. 成虫ニハ locomotive abd. appendage ハナイ. ガ thysanura ニハ rudimentary ナ abd. app. ガ残ッテイル. collembora デハ コレガ fuse シテ一ツノ organ ヲナス (Coxiphoea) higher order デハ 多クノ場合 胚ニ embryo / 時ニハ abd. app. / 存在 / 痕跡ガアル. i.e. 恐ラク insect / ancestor ハ abd. app. ヲモッテイタ / 然ルニ annelida / parapodia[×××] カラ引キ継ガレタト考ヘラレル. 発生学 / 方ハ多クノ Lepidoptera, Hymenoptera ニアラハレル 'prolegs' ハ thysanura / rudimentary

××× Packard 説

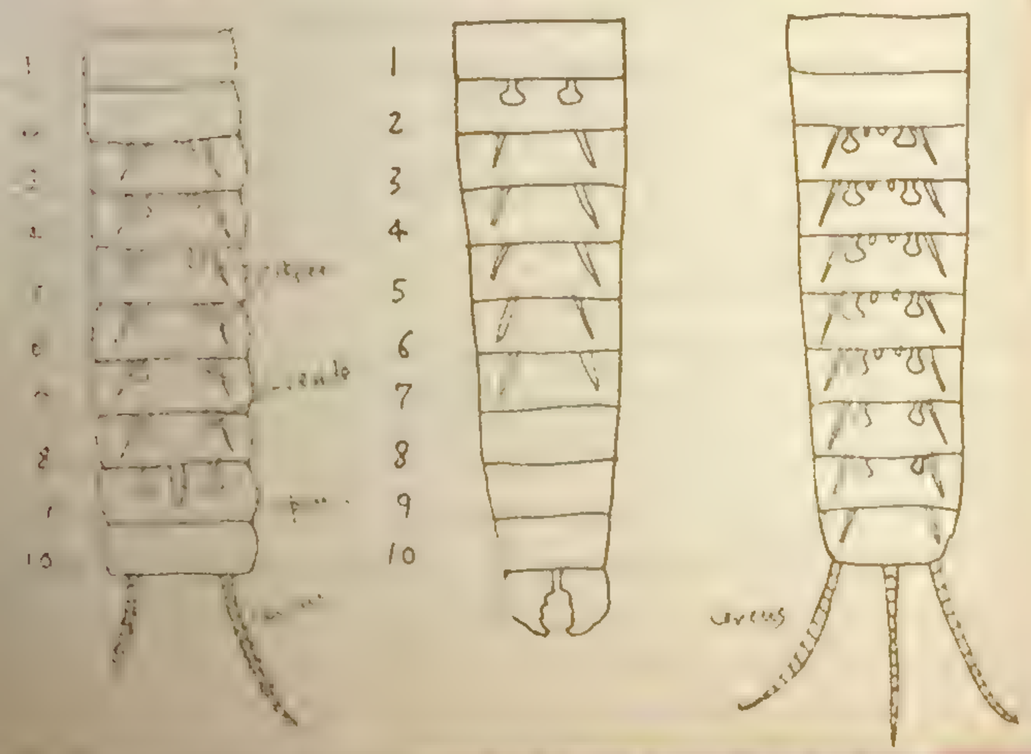
abd. app. = homologous ~~[illegible]~~ abd. appendages = ~~[illegible]~~ form ~~[illegible]~~

; stylet ; vesicle

stylet locomotive app. [illegible]

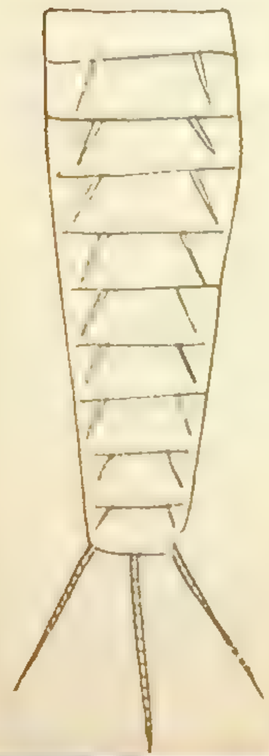
Garnier ~~[illegible]~~ stylet ~~[illegible]~~ branchial gill ~~[illegible]~~ Garin, Latreille ~~[illegible]~~ true [illegible] ~~[illegible]~~ crustacean ~~[illegible]~~ exopodite ~~[illegible]~~ (crustacean origin by Müller) ~~[illegible]~~ true locomotive app. ~~[illegible]~~. Haase ~~[illegible]~~ Tactile ie sense ~~[illegible]~~ sensu hair ~~[illegible]~~ Brassi ~~[illegible]~~

Campodea. Japyx. Machilis

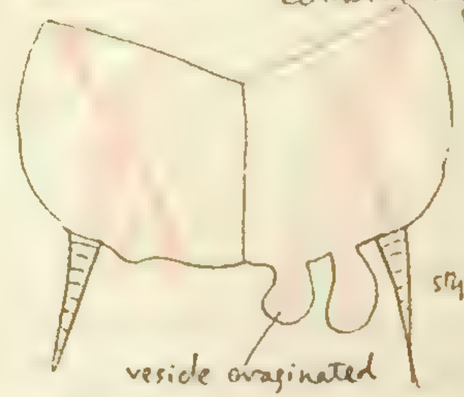



vesicle ~~[illegible]~~ Peripatus ~~[illegible]~~ coxal gland ~~[illegible]~~ Nicholet, Grassi ~~[illegible]~~ gill ~~[illegible]~~. Lubbock ~~[illegible]~~ embryonal stage ~~[illegible]~~ Trachea ~~[illegible]~~ Jourdain, Ondermans ~~[illegible]~~ Machilis ~~[illegible]~~ vesicle ~~[illegible]~~ invertible ~~[illegible]~~ wet ~~[illegible]~~ evaginate ie ~~[illegible]~~ respiratory ~~[illegible]~~ vesicle ~~[illegible]~~ cuticula ~~[illegible]~~ Scolopendrella ~~[illegible]~~ vesicle ~~[illegible]~~

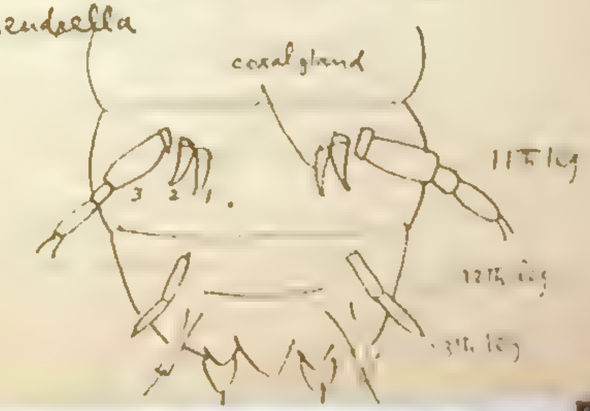
Lepisma



machilis (cross section)
compare ~~[illegible]~~




Scolopendrella



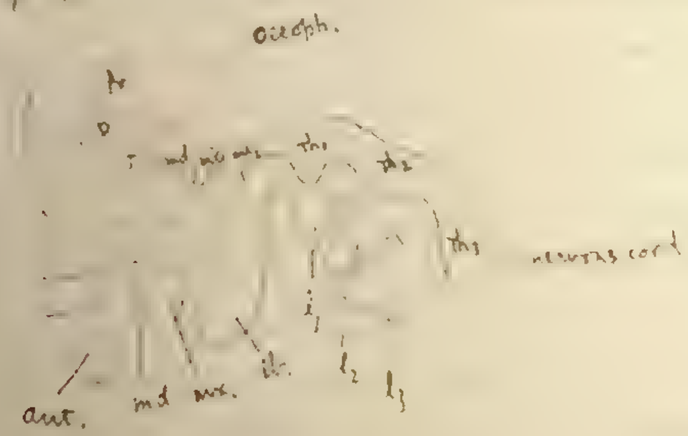

UND0039 Embryology Prof. Yuwasa, 1926

anal cerci ニハ wheeler ハ Oecanthus, Xiphidium ナドノ embryology ヲ ヨミ ソノ orthoptera ノ cerci ハ limb ニ homologous ナリ, 性質ハ function ハ tactile, olfactory. 又, 雄ニハ clasper ニ変ハルコトアリ. structure ハ 一方ニ multi-segmented ナリ. 他ノ一方ハ filiform. 又ハ cerci ハ特ニ ichneumoniform ノ如キ特ニ発達スルコトアリ

genitalia ナドモ其ノ起源ハ gonopophyses. ソレハ又 homologous ニ考ヘラレル.

ソノ abbreviation ノ結果ニ於テハ primitive ノ evidence ト云フモノニ過ギナイ.

rudimentary second antennae 昆虫ノ発生ナドヲミルト, segment ノ数ハ一定ナラズ, 或ハ segment ニ分ル, 或ハ segment ニ分ル…



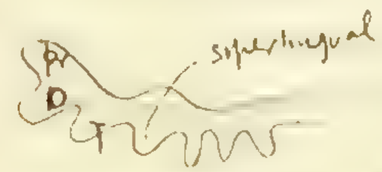

Anurida maritima (a sp. of Collembora)
Folsom, p.43.





× Folsom p.132.

| | | | | |
|---|---|---|---|---|
| preoral | 1 | ocular neuromere | protocerebrum } supra-oesophageal ganglion = brain | eyes |
| | 2 | antennal " | deutocerebrum | antennae |
| | 3 | intercalary " | tritocerebrum | |
| postoral | 4 | mandibular " | } sub oesophageal ganglion | mandibles |
| | — | (superlingual " )× | | |
| | 5 | maxillary " | | maxillae |
| | 6 | labial " | | labium |
| | 6 | | | |




~~superlingual~~ superlingual の発生 segment ~~[illegible]~~ ~~[illegible]~~

UND0040 | Entomology, Prof. Yuwasa, 1926

1 Parker-Haswell p. 278 Fig. 230.
2 ibid. p. 41.

~~metameti~~ Metamerism metamerism は symmetry と関係ア

ie. bilateral ~~sym~~ symmetry は linear arrangement of body segment

ナラバ metamerism は之ガ ことを Stipes ナル語ヲ用ヒテイル様ニ internal metam., rudimentary は incipient vestigial ナルベシ. 然ラバ imago ノ metamerism は distinct ナル larva ニハ不明ナルベシ origin of metamerism ニハ次ノ諸説アリ

colonial origin theory

Zooids ノ linear arrangement ヲナス様ナル connection ヲ function ノ為ニ ~~colony origin~~ budding ニヨル. Turbellaria[1] (Microstomum) ハ ~~ノ~~ Zooids ~~ノ~~ asexual reproduction ニヨル linear zooids ニ ノ segment ヲ持ツ.

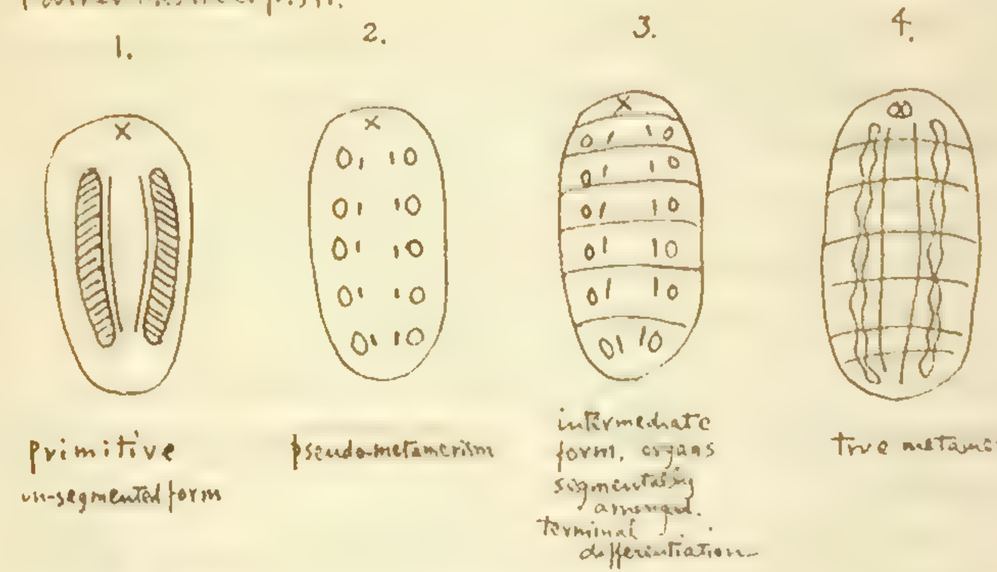
次ニ説. terminal growth theory. Cestoda ハ ~~ノ~~ 頭部ノ後ニ terminal ノ segment ガ絶エズ分裂シテ成長シテ行クガ故ニ metamerism ヲ生ズ

次ニ説 Lang's the. Pseudometamerism theory. primitive ナル segmentation ナレバ gonads segmentally[3] ニ在リ gonad, nervous system digestive organ, appendage ガ segmentally arrange セリ (internal ~~mat~~ segmentation) Lang ハ true metamerism ハ secondary pseudometamerism カラ進ンダモノデアルトシタ.

3. Parker Haswell p. 251.

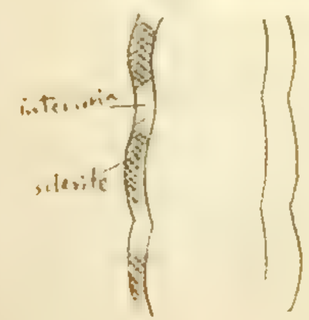
May. 25. -'7

Parker-Haswell p. 511.




次ニ説. mechanical origin of metamerism.

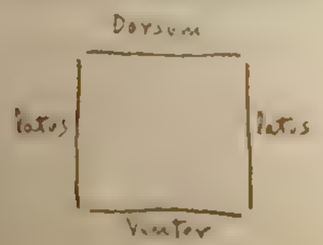
ナルベシ. 然ルニ Graber, 米ノ Packard etc, ハ之ニヨリ arthropoda ノ最初ノ cuticula ハ uniform ナル厚サナリシガ. 次ニ食ガ体皮ニ対シ関節ト間節トノ別アリテ ie intercoria ガ sclerite ノ間ニ出来ル. 之ガ metamerism ノ起源



1. unsegmented form (incipient stage)
   creeping gastrea
2. elongation of body. — creeping 現象の結果 生ず.
3. cephalo-podal differentiation. 同時に dorsal ventral surface の differentiation 起る — linear segmentation の実現
4. creeping surface の irregular なるため strength の strain 起る.
   — 内部に不均一な力 (mechanical strain)
5. この mechanical strain の力 体の大体同じ部分を刺激し 刺激の有無 強弱が 生ず
6. myotomisma の arrangement が定まってくる.
7. 新たに生じた体腔内に同じ機能を linear arrangement する — homonomous segmentation によって与えられる
8. 多分節 [illegible] 結果の生じ 体腔に使用されて intercoelum する — protarthropoda の実現

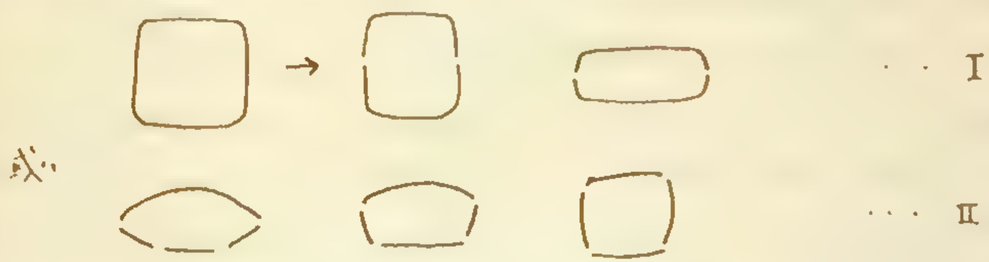
以上の metamerism の進化の経路から 昆虫の進化の程度を論じ得.

Prothorax の進化





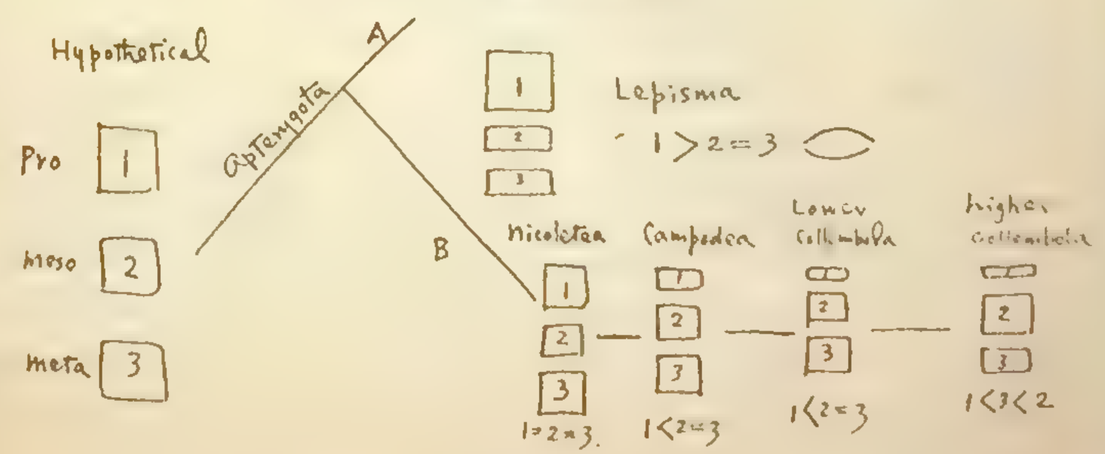

最初の昆虫は 円筒形に近いものであったと想像される. strain がある方向に従って

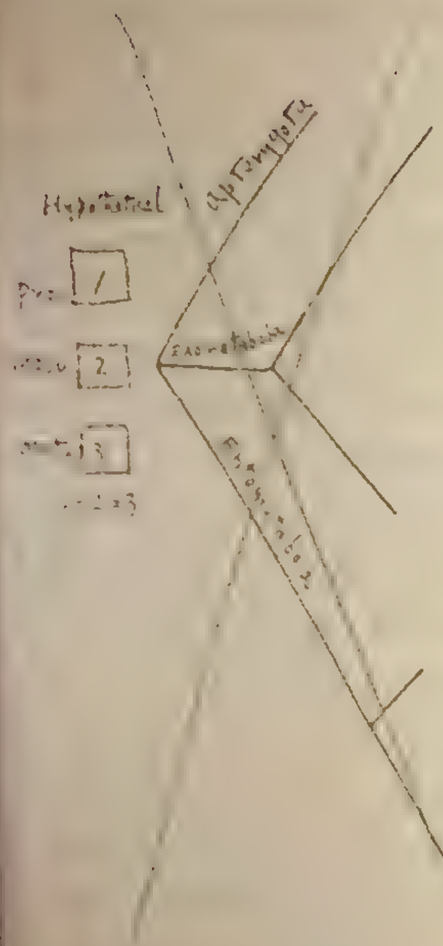


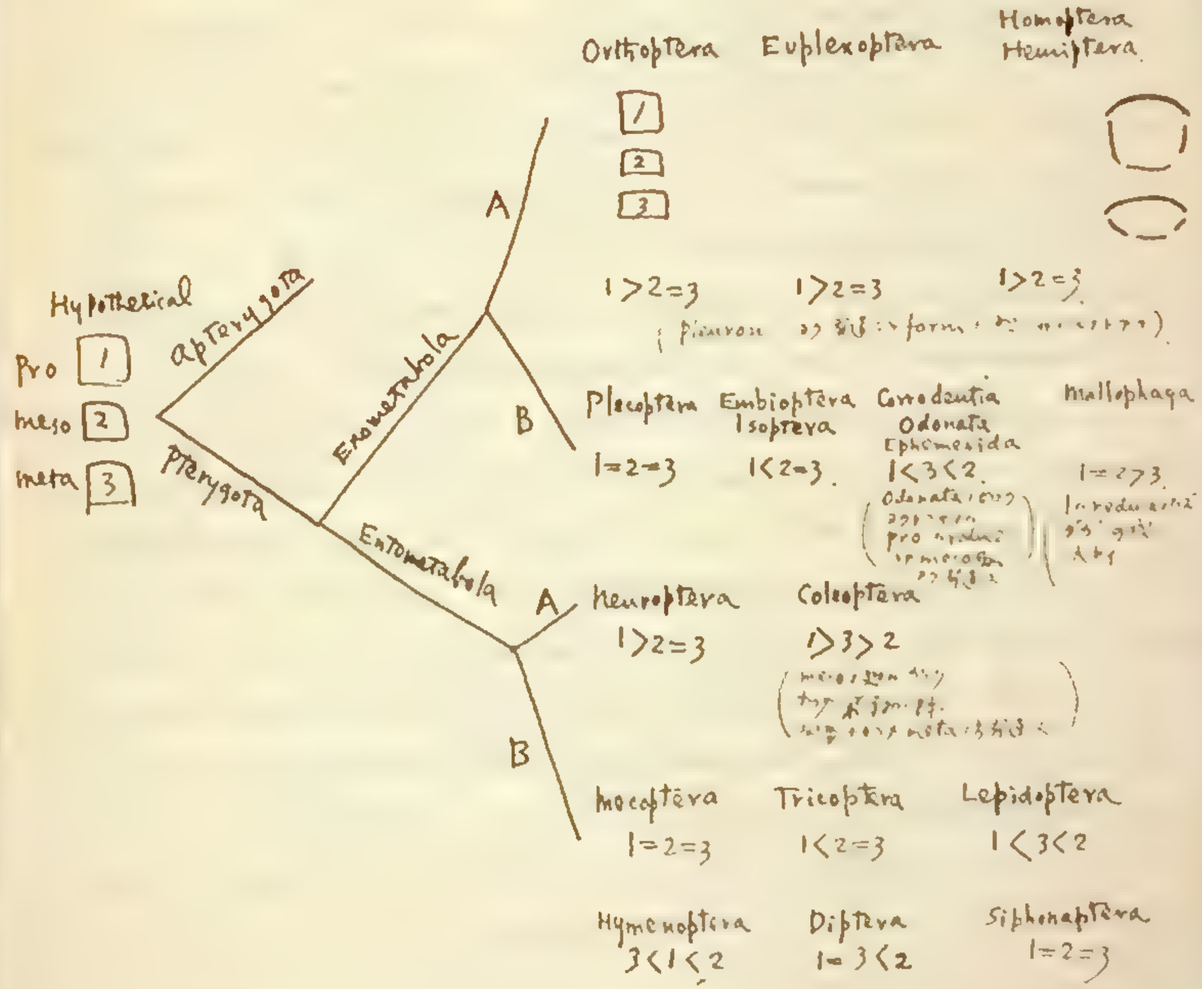

或は

現存の昆虫について 殺の形を見ると protothorax の進化 に二つの方向あり 一は enlargement 他は reduction である. この両方, 或は両方の過程を経て 現在の昆虫となる.

上図に於て I は mechanical + development が II に勝ちて 進化に伴ってゆくもの. 即ち 足 (分節) 人脚の発達 伴ってゆくもの (Kraan segment の如き) protothorax の enlargement, reduction は分類に用いる.






ie prothorax ノ性質ハ phylogenical ニ考ヘテ 第一ノ方法ニ natural ナラザル ∴ metamerism ノ mechanical origin ニ考ヘル。論據ノ薄ラナイ。

## Origin of Aquatic Insect

[illegible] 昆虫が [illegible] 水棲 [illegible] つ [illegible] ッタ. [illegible] crustacean origin [illegible] 現在ノモ [illegible] 学者中ニ [illegible] 信ズル人アリ ie. [illegible] 昆虫ガ gill [illegible] 棲ツカ [illegible] ツタ.

[illegible] 棲ハ secondary aquired habit ノ [illegible] ツテ [illegible] 説ハ [illegible] ナイ. [illegible] terrestial origin ノ evidence ハ [illegible] カ.

1. 水棲昆虫ハ phylogenetically ニ [illegible] ie natural group ヲ [illegible] (即 [illegible] Hymenoptera ノ [illegible] ノ [illegible] 様ナ)

plecoptera, ephemerida, tricoptera ノ [illegible] 水棲ノ習性ガ [illegible] higher order ニ [illegible] 水棲ノ [illegible] 時代ニ [illegible]

2. [illegible] 水棲昆虫ノ terrestrial organization ノ type ヲ [illegible]

i respiratory system ガ internal tracheation ヲ [illegible]

ii [illegible] chitin 質ノ外皮ヲ [illegible]

iii [illegible] 棲 respiration ニ [illegible] ノ [illegible]

3. most primitive ノ [illegible] 昆虫ガ [illegible] collembola ノ [illegible] 水面ニ [illegible] 長イ [illegible] aquatic habit [illegible] Thysanura ノ [illegible] 陸棲 [illegible]

4. ~~Transitional~~ Transitional form ノ [illegible]

Tipulidae ノ [illegible] hydrophylic [illegible] 陸生ニ [illegible] ie [illegible] 中. [illegible] 中. [illegible] dry substratum [illegible]

coleoptera ノ [illegible] sp. ノ life history 中ニ transition [illegible] ie habitat [illegible]

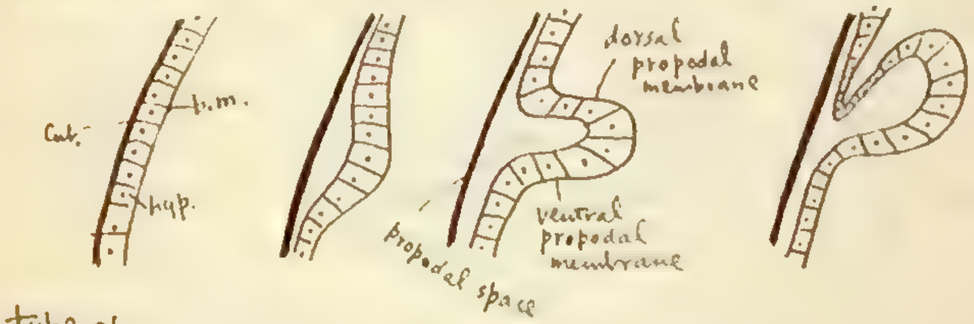
5. 今日 aquatic Insect ノ [illegible] 限 [illegible] ie [illegible] 代表. [illegible] 非常ニ [illegible] 水底ニ [illegible] (chironomus sp.)

[illegible] 昆虫ノ [illegible] ie [illegible] 昆虫 primitive [illegible] 棲 [illegible] 昆虫 [illegible] 水中ニ入ッテ [illegible]

ie Φ. 昆虫ガ wing ヲ [illegible] 陸ニ [illegible] transitional existence [illegible] tension ノ [illegible] adaptibility [illegible] 昆虫生活ノ [illegible] aquatic [illegible] aquired nature ノ [illegible] phylogenic [illegible] 重要ノ [illegible]

## Specialization of wings and its degree

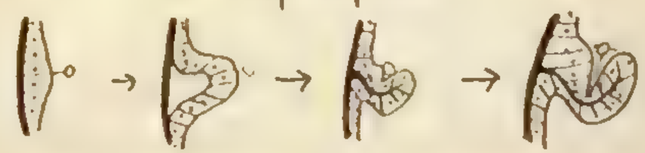
翅ノ有無. ancestor ニ wingless. arthropoda ヤ昆虫ノ祖先ガ翅ヲモツテヰタ. but primitive order ニ wingless. Holometabolous insect ヤ鳥ニ wing ヘ development ノ未熟ナ状態ヲ示シテヰル. 翅ノ発達ハ evolution ノ段階ヲ表ハスモノデアルカ? 例ヘバ中胸, 後胸ノ中ヨリ発スル細胞ノ延長デアル. i.e. tergum or pleurum or both ノ extention. 之ハ wing-buds or wing-discs ニ当ル.

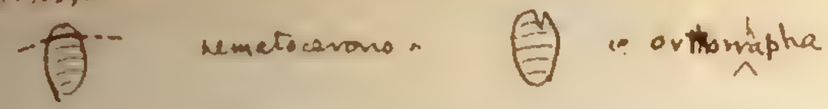



type of wing development.

1. Simple type = Exopterygota (Hetermetabola) + some of generalized Coleoptera

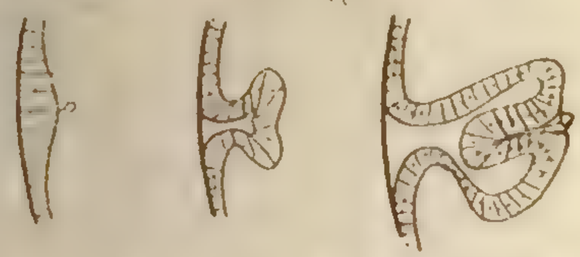
2. Enclosed type = coccinellidae, chrysomelidae, neuroptera. Lepidoptera



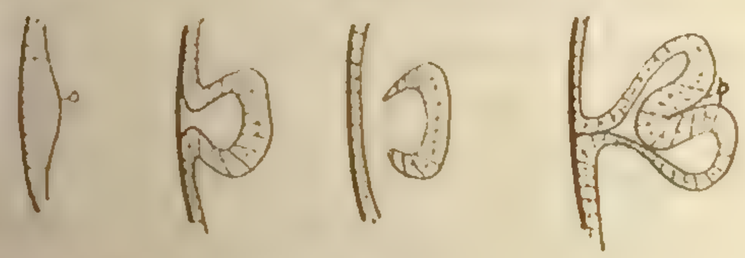



3. Recessed type — Scarabaeidae, nematocerous Diptera

4. Stalked type — Cyclorrhaphous Diptera.



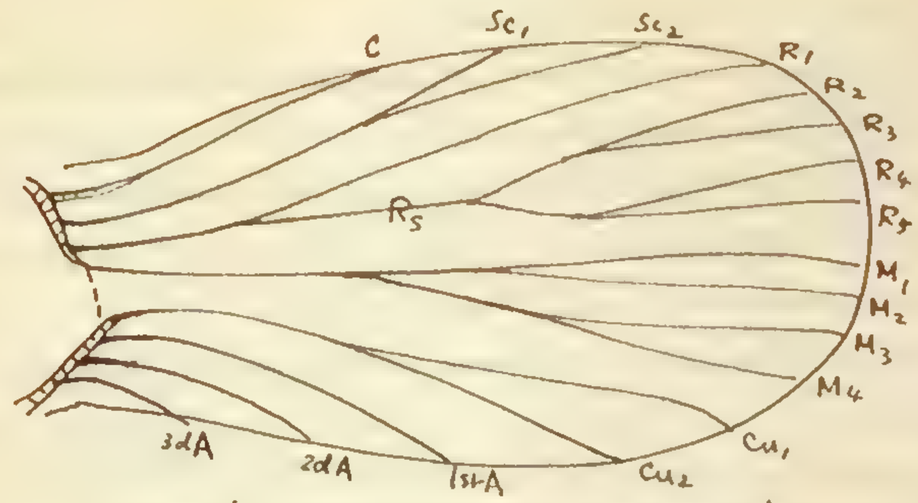
5. Detached type — Melophagus (=Hippoboscidae).



Veneration vis tracheation

trachea ノ分布ト脈トノ関係ハ trachea ガ vein ノ precedes デアルカラ ソノ分布ノ有様ニ依ッテ vein ガ定マル i.e. trachea ノ入ッテキラナイ= vein ガ出来ル

: vein ノ homology ハ trachea ノ分布ヲ為ス事ニ可ル




Comstock's hypothetical wing tracheation

generalization 1. Costo-radial + cubito-anal ノ二ツノ group ハ distinct origin ヨリ media ハ前者ニ属ス

2. Costo-radial + cubito-anal トハ 共ニ比較的 early ニ trachea ニ於テ connect セル media ハ之ト同様ニ cubito-anal ノ方ニ migrate スル.

cross vein. 1. primitive ナ state ニ於テハ longitudinal vein ト vein トノ area ハ多クノ細ク net ヲ traverse セル.

2. 然ルニ regular ナ 而シテ多クノ cross vein ヲ有ス

3. 然レドモ 進化スルニ cross vein ハ非常ニ reduce スル.

longitudinal vein 1. 然ルニ 其分岐ノ形式ハ comstock ノ hypothetical type ニ於テ代表セル. 但シ之ニ加フルニ 其ノ margin ニ生ズル多クノ accessory vein ヲ生ズ 之ハ inconstant 不同ナリ

—— specialization to three direction

2. vein の数は accessory veins の多いにつれて多くなる
3. intercalary veins の多いにつれて少くなる
4. vein の数は coalescence によって reduce する. 或は atrophy によって reduce する.

- accessory vein は primary vein の分岐したもの
- intercalary vein は primary vein と同様な secondary independent と解釈している.

Comstock 等の説は異論. Woodworth は異論の多いことを認めた. 多くの order に同じ function の同じ structure が出現する difficulty を防ぐために vein の成立に別な解釈をとった.

/polyphyletic theory.

## Apterygota vis Pterygota and Exopterygota vis Endopterygota.

Apterygota が primodarily wingless なる点を重視して 取扱ふ べきものとする. (化石なしとせず).

origin of wings.

1. gill theory. 初め tracheal gill 又は branchial apparatus から発生した

i 最も原始的な annelida の dorsal gill が進化したとの説.

ii Ephemerida の larva に見られる tracheal gill が進化したとの説

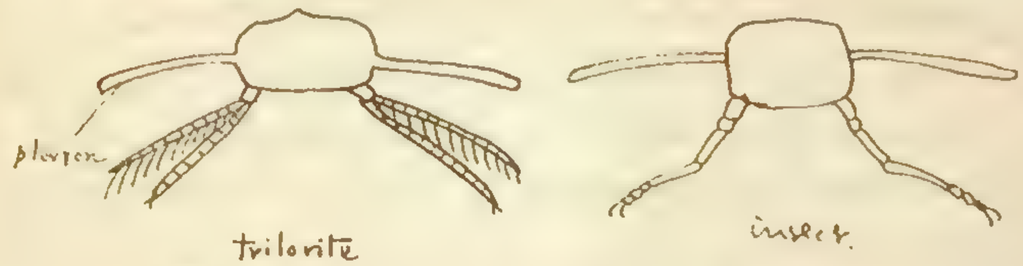
但し 何れも terrestrial origin, gill の位置と翅の位置との関係不明なる作用

× 体節 Body segment の発達に伴ひ parachutes の如きものとなる.

II. Body wall の extention 説

これは此等を parachutes とみなしたもの.(parachutes theory).

i. 化石学者達の認めるところ Trilobites の pleuron から進化したとの説 (Handlirsch, Lameere)




ii. 新しい new growth とするエンゲルハルトの説. (多くの entomologist) の new development の経路は

1. parachutes 生ず
2. differentiation 起り. 胸部の一部に進化する.
3. 上下板が可動となれば中間に関節 hinge を生ずる
4. 翅となる.

## Exopterygota vis Endopterygota

この両 group は同様に取扱ふべきと云ふ人は Mallophaga, Aphaniptera, Siphonaptera 等の一つの group Anapterygota なるものを作る.

Exopterygota → Anapterygota → Endopterygota

なる stage を経たものと.

進化は次の如くと云ふ説

Winglessness → external wing → internal wing.

× Coleoptera, Family Tenebrionidae.

evidence 1. Endopterygota ♀= larva = 51 ; external wing ;
[illegible] stage ; [illegible] B. Tenebrio molitor.
prepupa (last larval stage) ⟶ external
pupa — external

Cavalridae ; Lebia scapularis ; prepupa ; external wing [illegible].
Strepsiptera ; ♂ ; prepupa stage ; [illegible].
2. Exopterygota ⟶ internal wing ; [illegible].
Homoptera ; aleyrodidae, ♂ coccid ; imago = [illegible] ; [illegible] wing
[illegible]

[illegible] intermediate species ; [illegible] suggestive [illegible].

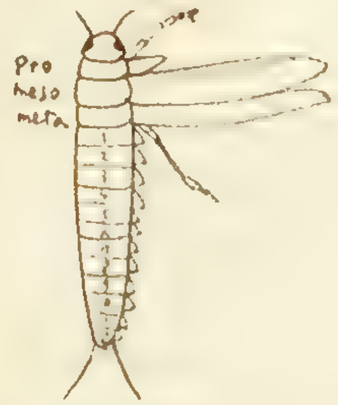
wing origin = [illegible] [illegible] data

[illegible] upper carboniferous formation = [illegible]. [illegible] 900.
[illegible] Palaeodictyoptera [illegible] primodial insect [illegible]
~~[illegible] wing [illegible]~~
[illegible] Stenodictya [illegible] wing development
1. abdomen ; wing [illegible].
2. prothorax ; wing [illegible]
3. mesometa ; [illegible] fold [illegible] (Handlirsch)

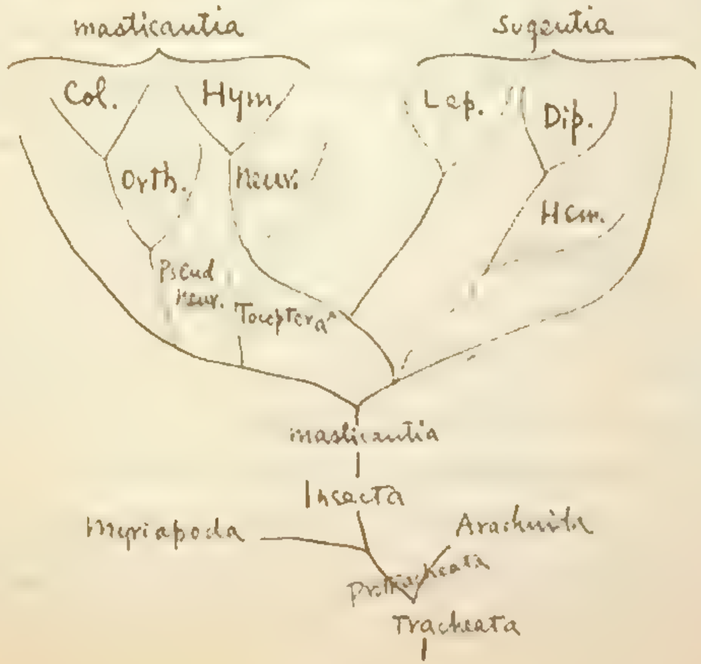
× Toeoptera ; Grimmeria

June 15.

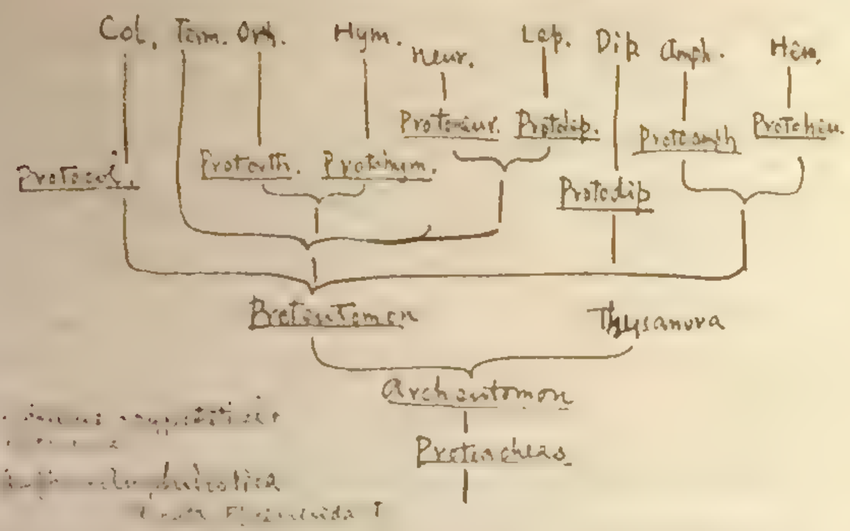
Stenodictya lobata. upper carboniferous formation.



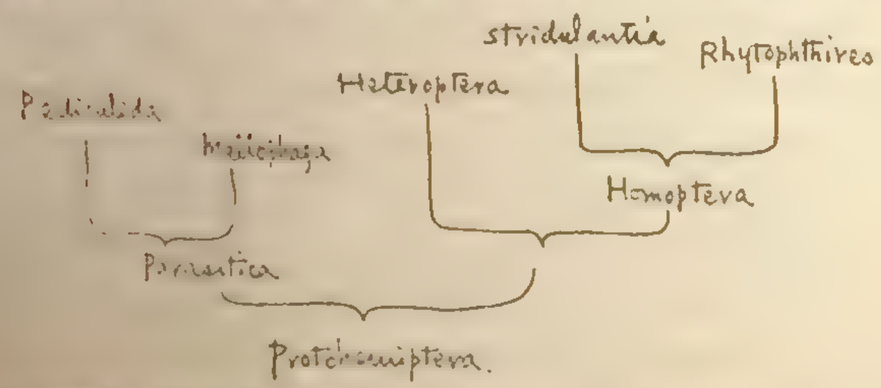

phylogeny ; — ; speculation [illegible]
1. E. Haeckel 1866. Generalle morphologie.



2. Paul Mayer 1876 Über Ontogenie und Phylogenie der Insekten. Jenais. Zeits. Natura. Bd. X: 125–221



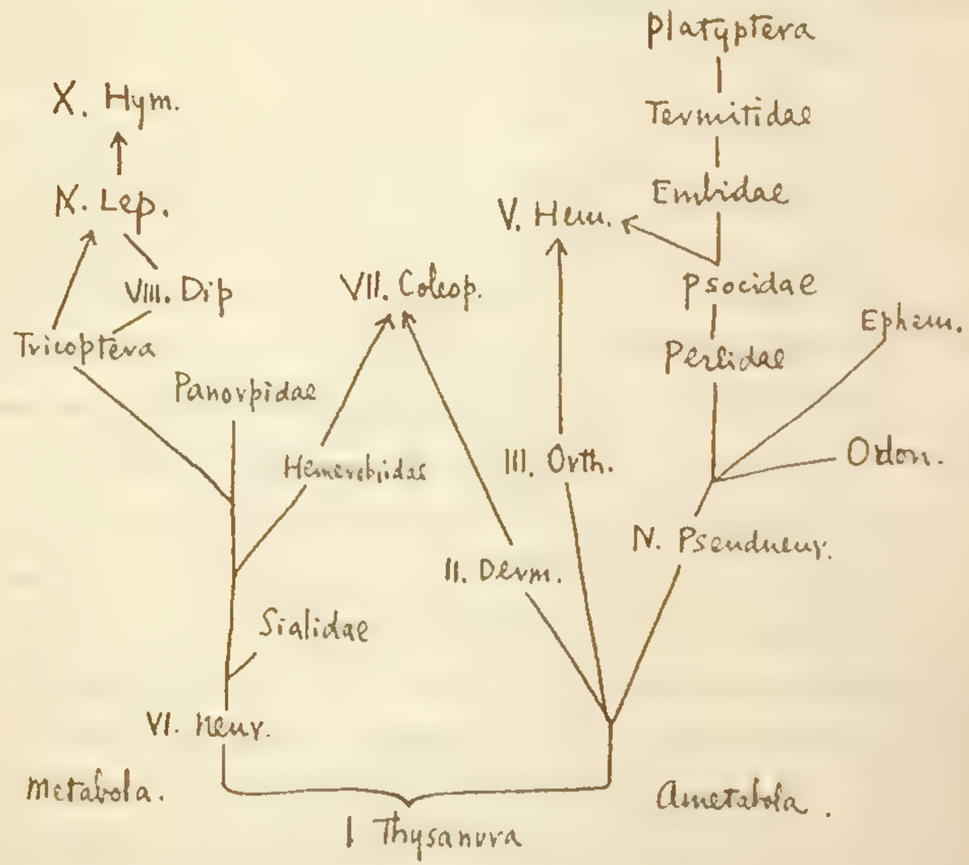

[illegible] Mayer's system [illegible]




[illegible] Mayer [illegible] Order [illegible]

[illegible] Protentomen [illegible] definition [illegible] comprehensive [illegible]

3. A. S. Packard. 1883. The systematic position of the Orthoptera in relation to other orders of insects. 3rd Report U.S. Entomological Commission: 286–304.



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I. Klasse Apterygogenea.

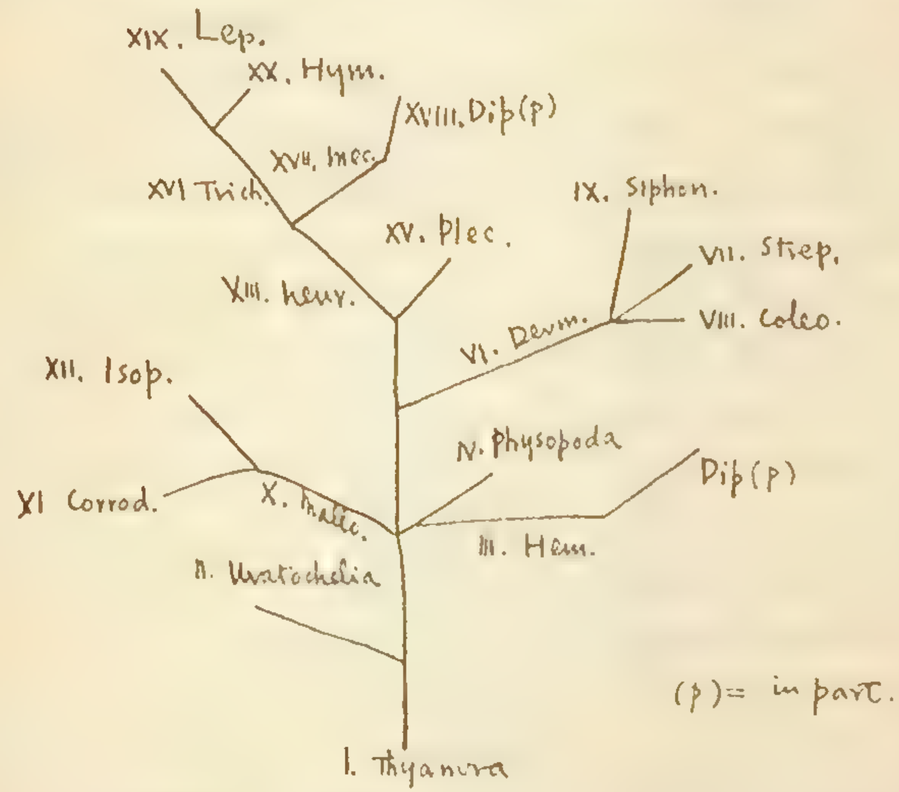
II. " Pterygogenea.

| Ordnung | | | | |
|---|---|---|---|---|
| 1. Dipl. | 1. | | 1. | |
| 2. Ephem. | 2. Subulicorn | | 2. Amphibiotica | 1. Orth. s.l. Geröstecker. |
| 3. Odon. | | | | |
| 4. Plecop. | 3. | | | |
| 5. Orth. (Gen.) | 4. | | 3. | |
| 6. Corrod. | 5. | | 4. | |
| 7. Thysanop. | 6. | | 5. | 2. Thysanoptera. |
| 8. Rhynchota | 7. | | 6. | 3. Hemorhyncha |
| 9. Neur. | 8. | | 7. Neur. s.l. Eriksson | |
| 10. Panorpatae | 9. | | | 4. Petanoptera |
| 11. Trichoptera | | | | |
| 12. Lep. | 10 | | 8. Metagnatha. | |
| 13. ~~Siphonap.~~ Dip. | | | | |
| 14. Siphonap. | 11. | | | |
| 15. Coleo. | 12. | | 9. | 5. Col. |
| 16. Hym. | 13 | | 10. | 6. Hym. |

(Gen.) = Genina, s.l. = in the sense of.

[illegible] Polynephria + Oligonephria =, [illegible] part [illegible] Menognatha, metagnatha [illegible] phylogeny [illegible] distribution [illegible] derivative [illegible]

5. W. H. Ashmead. 1896. Proc. Ent. Soc. Wash. III.




(p) = in part.

Ashmead の Hymenoptera の系統樹 [illegible] phylogeny の [illegible] 1896年 Mallophaga が Isoptera の [illegible] derive [illegible] Uratochelia の Odonata, Ephemerida etc.

6. E. Haeckel. 1896. Systematische Phylogenie. Handbuch: 1216.

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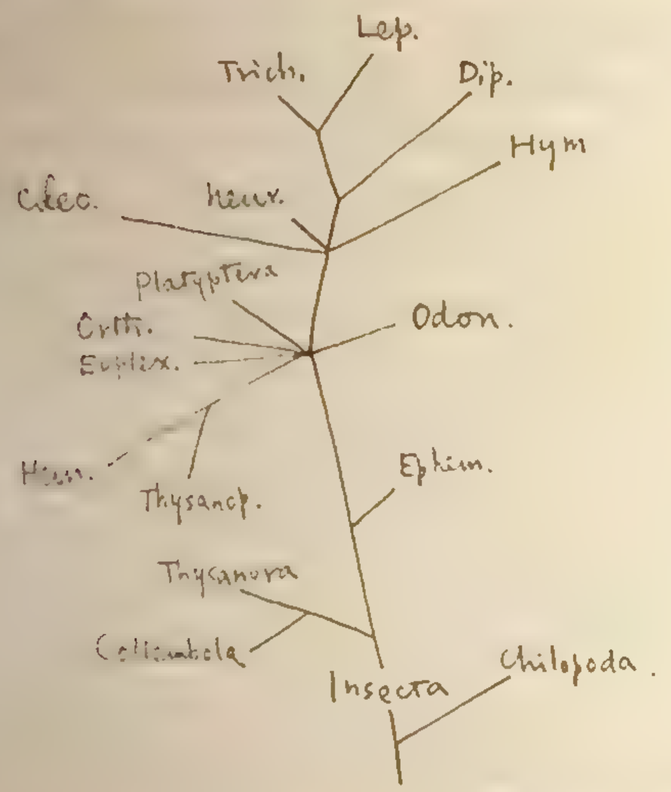



common predecessor

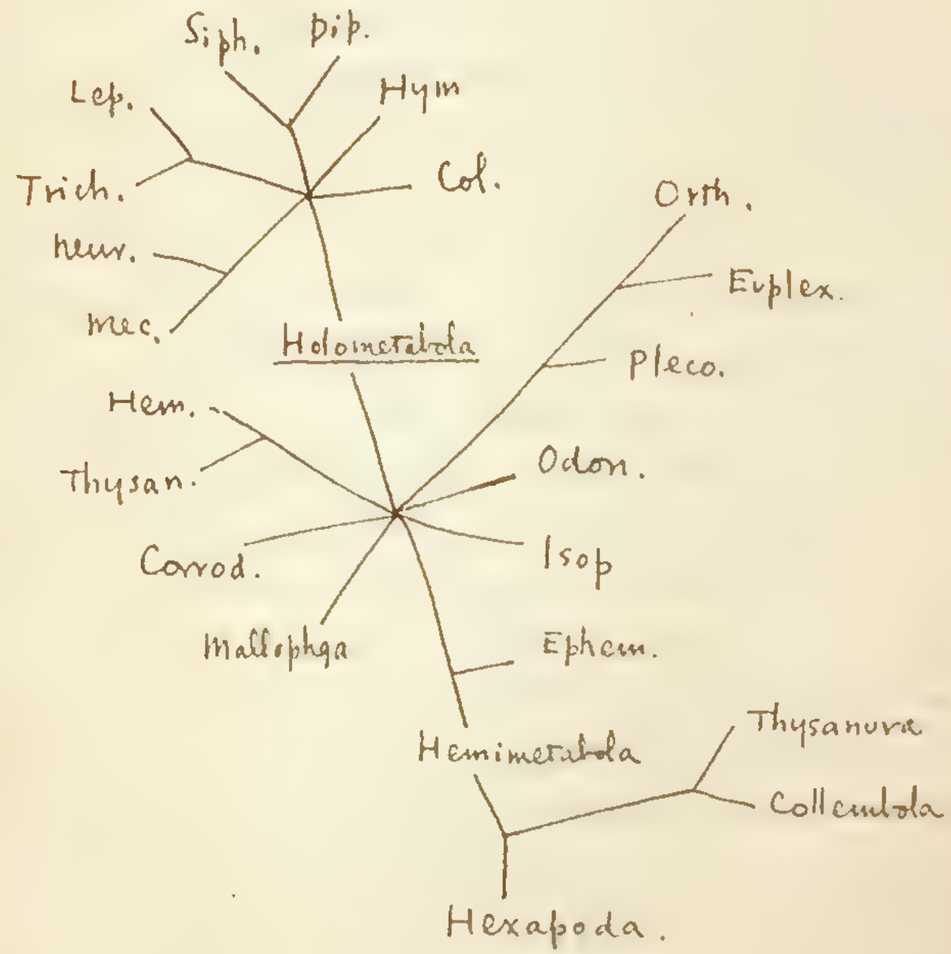
Brauer

phylogeny

metamorphosis is polyphyletic

~~8. H. T. Fernald~~

8. H. T. Fernald.

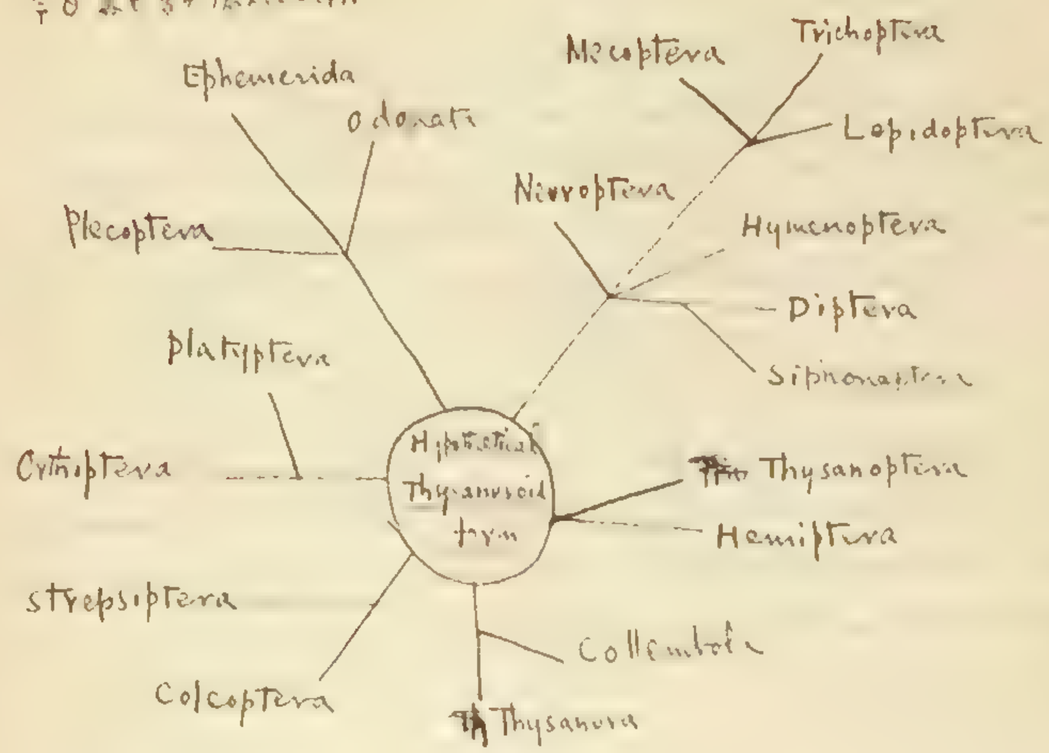


9. Anton Handlirsch.

1908年に出版されたもの。その1908年 Die fossilen Insekten と
その年 1921. Schröder Handbuch Bd III Kapitel VIII 353–36
を基にして話す 主要な論点

1. 昆虫の祖先 Campodea のような代表的なものの説 反対
2. 昆虫 crustacea, trilobite と共通の祖先から分化した 共通の ancestor
とした 古生代の paleodictyoptera に近いと思う (Trilobito paleodictyoptera
theory)
3. winged insect の monophyletic origin を唱える
4. apterygogenea の origin については二つの possibility を考える.
   i winged の中の wing のない
   ii pterygogenea → apterygogenea
   ↑ ur former から両者の分化した
5. 卵の孵化した子と成虫は lated on である.
6. 卵から子虫への発育に各段階が生じた.

今日 最も多く採用されている




結論.

1. Hexapoda origin
   i annelidan Campodea theory.
   polychaeta → Onychophora → Thysanura
   ii Thysanura の ur form は Campodea の中 之は Brancheata の中から
   分化したもの
   ii Apterygogenea → pterygogenea.
   ii Crustacean paleodictyoptera theory.
   Brancheata crustacean Trilobite → paleodictyoptera

UND0052 Entomology Prof. YUMEZ 1936

[illegible] Handlirsch [illegible]

i apterygogenea ← pterygogenea
↖ ↗
Stammformen.

2. Hexapoda, order, [illegible] (on the unity of Hexapoda).
  i Hexapoda, monophyletic origin (Handlirsch)
  ii polyphyletic · (Packard, Kingsley)

3. Interrelation of insect order
  i conservative theory [illegible] majority.
  ii ~~radical~~ radical theory. Handlirsch, [illegible], Melander [illegible]

4. On the classification of Hexapoda.
  i conservative. numbers of orders 20–25.
  ii radical 35 or more.

5. Our stand.

[illegible] speciation [illegible] conservative [illegible] radical [illegible] choice [illegible] ~~[illegible]~~.

[illegible] Handlirsch. Schröder.

# BIBLIOGRAPHY

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世界中の多くの論文の所在が知られている。世界の二大図書館の

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ii paris Bibliotheca National.

∴ この二図書館の図書目録は最も豊富な資料を与えている。

i. 1. Catalogue of printed books in the library of the British Museum. London.

1881 — 1900 394 parts.

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9. Concilium bibliographicum and index Dewey decimal system

June 24.

Ent. Bibliographies.

1. Hagen, A. Bibliotheca Entomologica. 1862–1864. down to 1862. (author Index)
2. —— Zoological Record 'Insecta'. 1864–1924
3. Taschenbergs Bib. Zoologica 1863
4. Entomologische Litteraturblätter. 1901–1914.
   Friedländer & Sohn, Berlin. 最初は毎月一冊宛
5. Deutsche Ent. Zeitschrift. 1875–1926.
   'Referate' 'Regesionen' ナル。1924ノ4ノ Entomologische Litteraturblätter ヲ取込ム。1925ヨリハ 別冊ニ 発行ス。'Repertorium Entomologicum' ト題シテ
6. Entomological News. 月刊. 'Literature'
7. Ent. Mitteilungen. 1912—. 'Neue Literatur'
8. Psyche. 1874–1910 'Review'.
9. Zeitschrift f. wiss. Insektenbiologie. 1905— 'Lit-Referate'
10. Ent. Anzeigen. 1920— 〃

Economic

1. Henshaw & Banks. Bibliography of American Economic Entomology. Vol. 1–7
2. Banks. 1917. Index to the literature of amer. Ec. Ent. 1905–1914.
3. Colcord. 1921. 〃 1915–1919.
4. 〃 1925 〃 1920–1924.
   ※印ノ本誌ニハ掲載セラレタル論文ニ付テハ
5. Review of Applied Entomology. 1910— monthly.
   Series A — Agriculture.

[illegible] 8. — [illegible]

[illegible]

6. Experimental Station Record.

[illegible]

7. [illegible] Ent. 1914 — 'neue Literatur.' 'Lit. Referate'.

8. Catalogues, lists, etc.

[illegible] W. Junk / [illegible]

Generic Index.

| | | Covers. | Pages or Entories. |
|---|---|---|---|
| 1 | Agassiz, L. Nomenclator Zoologicus | down to 1846. | 1135 pp 32964 ent. |
| 2 | Marschall, A. " | 1846–1868 | 422 pp 19946 Ent. |
| 3 | Scudder, S.H. " | To 1879 | 340 pp |
| | [illegible] complete [illegible] | | |
| 4 | Westwood, C.O. Index Zoologicus. | 1879–1900 | 421 pp |
| 5. | " " | 1900–1910 | 324 pp |
| 6. | Zool. Record. | 1864–1924. | — |

Specific Index.

1. Sherborn 1902. Index Animalium. 1758–1800.
(names of species and genera)

2. 1) check list.
2) specific index.

3) monographs.

3. Zool. Record.

Citation.

Author's Name. year published. Title.

Journal, published Vol. page.

例.
Alexander, C.P. 1922. Undescribed crane-flies from Formosa and Luzon Islands.

Proc. Philipp. J. Sc. XXII: 467–481.

abbreviation Mo = Missouri. Pennsylvania = Pa. Maine = Me.

Proc. Trans. Ent. America = Am. Amer.

cited from. according to. after. such.

Index card [illegible]. Library card.

# Insect Behavior

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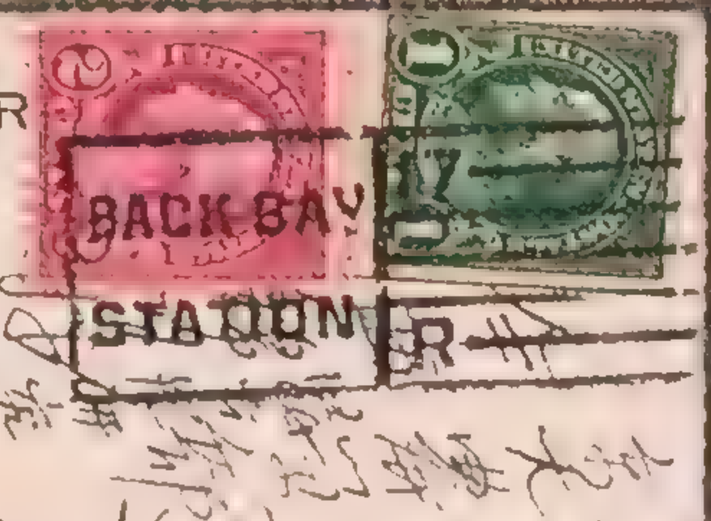


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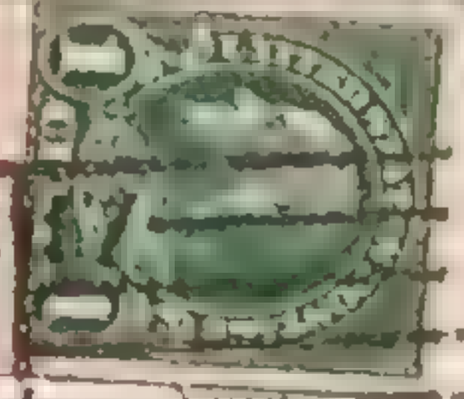

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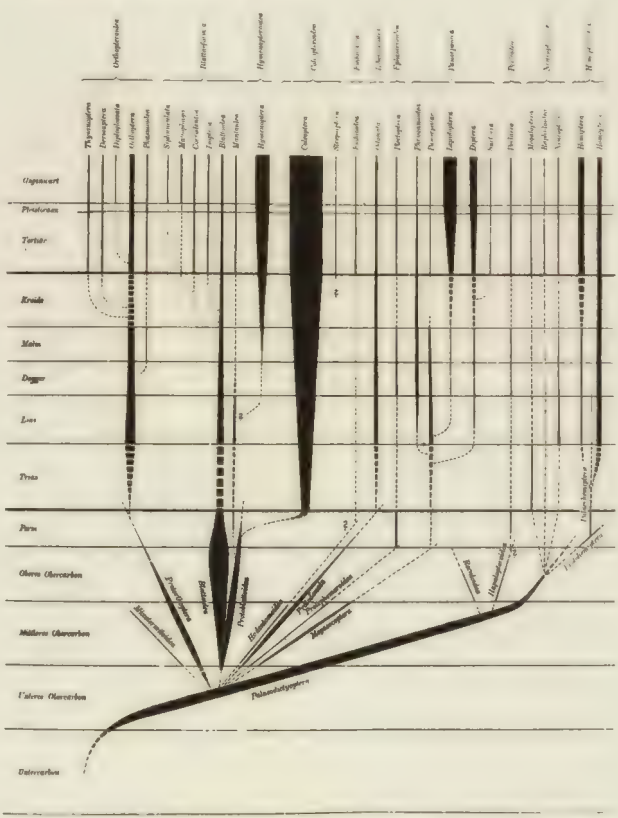
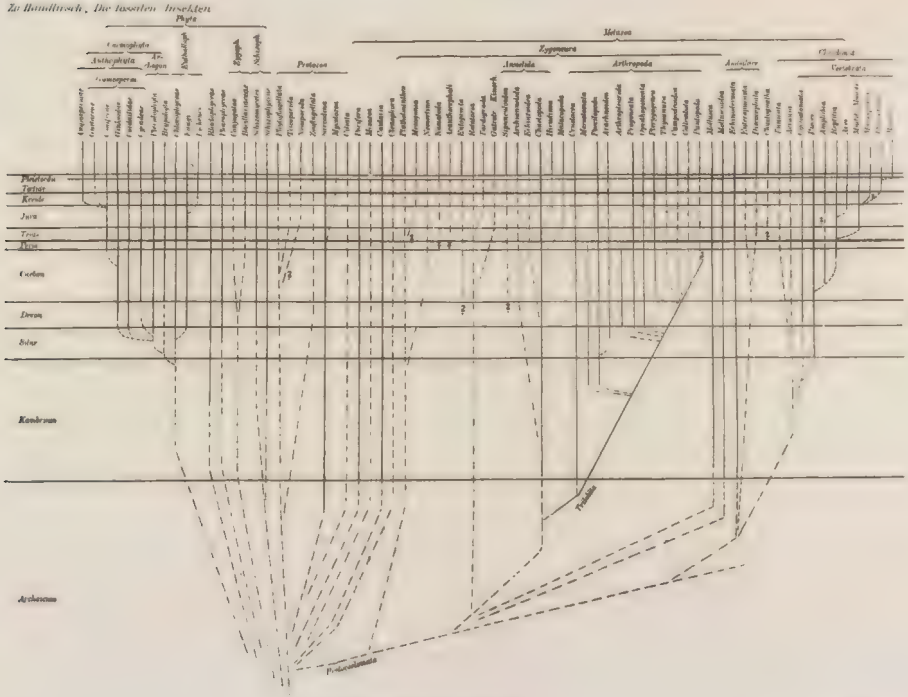

Orthopteroiden
Blattiferen
Hymenopteroiden
Coleopteroiden
Dermapteren
Hydrophilomiden
Coleopteren
Phasmiden
Sphinxiden
Mecoptera
Corydaliden
Fulgoriden
Blattiden
Mantiden
Hymenopteren
Coleopteren
Stylopiden
Scolioiden
Chrysiden
Ichneumoniden
Oplopteriden
Phrynocnemiden
Prosopiden
Lagriiden
Dipteren
Nycteribiiden
Pediliiden
Mymarididen
Rhaphidioiden
Neuroptera
Hemipteren
Homoptera
Gegenwart
Pleistocen
Tertiär
Kreide
Malm
Dogger
Lias
Trias
Perm
Oberes Oberkarbon
Mittleres Oberkarbon
Unteres Oberkarbon
Unterkarbon
Protodiptera
Mecoptera
Protodictyopteren
Homoeoptiliiden
Protelytroptera
Palaeodictyopteren
Megasecoptera
Protoblattoidea
Protorthoptera
Palaeoptera
Homoeoptiliiden
Dictyoneuriiden
Protelytroptera
Protodiptera

1908

Zu Handlirsch, Die fossilen Insekten




Verlag von Wilhelm Engelmann in Leipzig

1908

...shborne 1917. animal mind. chap. 1.&2.

...ものに対する名称. 生理学的用語 [illegible].

[Letisimulation 擬死]

〃 Hypnose 擬眠. (death feigning, sham death).

letisimulation. simulare = To feign.

...Stillstand, schreckstarre, starrezustand, akinase, katalepsie.

[illegible]

letisimulation の Literatur 研究は最初は Turner (1913) が revive された様子

phenomena — 特殊な場合に sporadic なり. 進化的に系統的に [illegible]

[illegible] Arthropoda の中で 特に crustacea (crab, Isopoda, [illegible] order, 特に beetle, Hemiptera, Hymenoptera に [illegible]

[illegible] Vertebrata の魚(特). Amphibia, birds, säugern (たとへば opossum の 'playing possum' と言ふ death feigning の代表的な例 [illegible])

[illegible]

1907 Fabre. Scarites 2 spp. Geotrupes.

[illegible] 17 species. 1906 Holmes. Ranatra

1911 [illegible] & Northrop. Conotrachelus

1913 Dyar. myrmeleon (neurop.) 1913 Schmidt. Dixippus.

1913 Szymanski Periplaneta.

1913 Hofmann Tomocerus (collembola). Blatta, Zimmotrichonium

1921 Grimpe. Phyllium (orthop.)

文献 Holmes, S.T. 1916. Studies in animal behavior. 197-218

Manold. 1914 Hypnose und Katalepsie bei Tiere im Vergleich zur Menschlichen Hypnose.

Hempelmann. Tierpsychologie. Tierische Hypnose u. Suggestion. 579-582.

Hypnose = 特殊な body attitude

[illegible] Nepa [illegible] (after Severin)

attitude の中で [illegible]

a. 身体・脚を縮める (compact as can) [illegible]

b. appendage を stick out する [illegible] Conotrachelus. Plum curculio [illegible]

[illegible] appendage を [illegible] 又は [illegible] [illegible] Ranatra

[illegible] Reiz [illegible] attitude [illegible] time [illegible]. Reiz [illegible]

rein Berührung (or contact stimuli) [illegible] Plum curculio [illegible]

1. [illegible]

2. [illegible]

3. [illegible] ventral surface [illegible]

Belostoma, Nepa, Ranatra [illegible] Hypnose [illegible] weevil [illegible] Valentiner [illegible] sufficient cause [illegible]. [illegible] authion [illegible] Temp. light, pressure, moisture [illegible] light [illegible] Temp [illegible] effect [illegible] moist. [illegible] sand particle, pressure [illegible] water insect [illegible] Temp. press. [illegible] contact [illegible] authion [illegible] humidity [illegible] Temp. [illegible] Hypnose [illegible] Tenthrenidae [illegible] Hypnose [illegible] (pressure [illegible] pressure [illegible]

## duration of Hetisimulation

duration は [illegible] 度 [illegible] 度 [illegible] 度 

anthion, Belostoma.

b. [illegible] duration ヲ prolong ス. 例 Ranatra, Nepa, Anthion.

c. 部分的ニ [illegible] duration ヲ短クス. Belostoma

3. rate ヲ change of temp ト [illegible] 例 [illegible] Nepa, Belostoma.

## Effect of light

[illegible] anthion [illegible] 弱ク分布セル [illegible] 弱ク [illegible] 切ッテ [illegible]

Ranatra [illegible] 切ッテ [illegible]

[illegible] der Licht (Ranatra)

| | bei hellem Licht = kurz dicht | bei schwachem Licht | Bewegtes L. | | Ruhiges L. | |
|---|---|---|---|---|---|---|
| [illegible] Tiere | 12 | 12 | 5 | 7 | 5 | 7 |
| [illegible] | 95.8 | 116 | 11.2 | 11.4 | 34.2 | 30.2 |

Belostoma [illegible] light ノ duration ヲ延ブル. [illegible] 5ヲ [illegible] (Confluts ?) [illegible] (暗室) 室内デ 16 candle [illegible] lamp ヲ [illegible]

| | aver. of first 3 feints | | | | | | ave |
|---|---|---|---|---|---|---|---|
| [illegible] bright | 4.5 | 10 | 13.5 | 21 | 21 | 26 | 16 |
| dim light | [illegible] | 28 | 18.5 | 28.5 | 29 | 30 | 28.6 |

[illegible] Nepa [illegible] Licht ノ Dauer ヲ延ブル

| | kept in bright light (ringform experiment) | | kept in darkness (then transfered to bright l.) |
|---|---|---|---|
| [illegible] | 18°c | 14.8 min | 9 |
| [illegible] | 18°c | 16 | 6.2 |
| [illegible] | 15°c | 10.8 | 4.7 |

moving light ノ effect. (Nepa).

| stationary | moving |
|---|---|
| 12.8 min. | 7.3 |
| 15.9 | 10.9. |

conclusion 1. 変化ハ danger ヲ防ク.

2. bright light ハ大ニ [illegible] dim light ノ [illegible]

3. moving light ハ [illegible] stationary light ハ [illegible]

## Effect of chemicals

Conotrachelus nenuphar [illegible] ether, chloroform, $S_2C$, $CO_2$ [illegible] Hypn. [illegible] mutilate [illegible] chemicals ノ [illegible] normal state [illegible] (Geo & Lathrop).

[illegible] Hypnose [illegible] chemicals ノ [illegible] 不明ナル [illegible]

### Moisture & duration

Belostoma 15 [illegible] first feint Total average 6.8 min. control 24.9. [illegible] Hypnose [illegible] inct. 47.3 min. air [illegible] (Surface film) ト duration ハ 11.6 min. [illegible] Nepa ハ [illegible] durable [illegible] Severin [illegible] successive feign, duration ハ nerve ノ fatigue [illegible] moisture [illegible] degree [illegible]

## physiologie der Hypnose

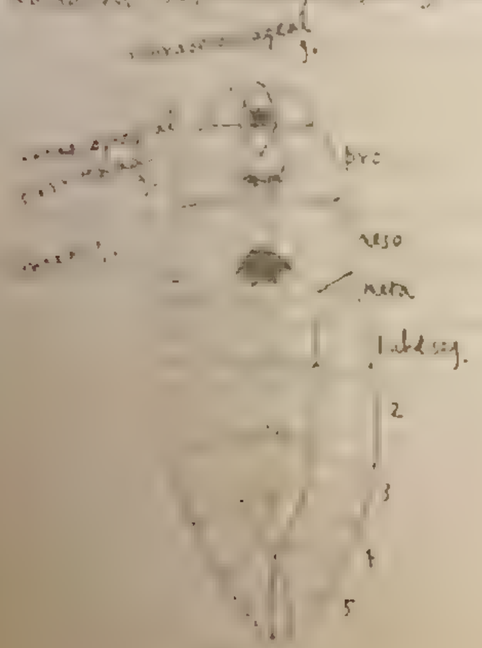
1. [illegible] species [illegible] mechanismus [illegible] 例 [illegible] Säugetiere or Vögel [illegible] muskel ノ retardation [illegible] invertebrata [illegible] muskel ノ [illegible]

[illegible] muskel ノ [illegible] tension [illegible]

[illegible] Tetanus [illegible] Reiz [illegible] tonus [illegible]

2 feign [illegible] 生じない. Belostoma, Ranatra, Nepa, Dixxipus [illegible]
[illegible] feign [illegible] scheinbar [illegible]
? nervous mechanism [illegible] nervous center [illegible] species [illegible]
[illegible]

... methoin [illegible]. b. extirpation [illegible] 焼 [illegible]
[illegible] 後 [illegible] feign [illegible] more [illegible] 又 duration [illegible] short. thorax
[illegible] normally [illegible] feign [illegible] Reizt [illegible] feign
[illegible] negativ [illegible] recover [illegible]. Turner [illegible]
[illegible] mandible [illegible] response [illegible]
[illegible] supraoesophageal g. [illegible] Dauer [illegible] verkürzen [illegible] prothorax [illegible]
[illegible] posterior part [illegible] Hypn. [illegible]
[illegible] Belostoma (after Severin) [illegible] decapitation [illegible] supraoeso. g. [illegible]
[illegible] operation [illegible] shock
effect [illegible]. posterior [illegible] feign [illegible]
[illegible] 又 feign [illegible] muscle [illegible] contract
[illegible]. decapitation [illegible]
[illegible] recovery [illegible] 又 [illegible]
[illegible] gently [illegible] touch
[illegible] constriction [illegible]
feign [illegible] duration [illegible]
[illegible] inhibition [illegible]




[illegible] Blutung, Einflüsse [illegible] pro [illegible] meso [illegible] feign
[illegible] duration [illegible]

| | head と pro | meso meta と abdomen. |
|---|---|---|
| | 1 min. | 9 min |
| | 1.5 | 14 |
| | 3 | 4 |
| | 3 | 3.5 |
| | 5 | 18 |
| | 7 | 5.5 |
| | 13 | 14 |
| | 17 | 25 |
| aver. | 6.3 | 11.6. |

[illegible] duration [illegible] shock effect [illegible]
[illegible] meso と abdomen [illegible] Hypn. [illegible] Tonus [illegible]
only one [illegible]. Tonus [illegible] ganglion [illegible] characteristic
[illegible]. Nepa [illegible] Belostoma と [illegible] ganglion system [illegible]
decapitation [illegible] feign [illegible] recover [illegible]
[illegible] feign [illegible]. pro と meso [illegible] anterior part [illegible] Hyp.
[illegible] posterior [illegible] Tonus [illegible]. 再び Reiz [illegible] feign [illegible] repeat [illegible]
posterior [illegible]. meta と abdomen [illegible] anterior part [illegible]
[illegible] posterior part [illegible] stimulate [illegible]

<u>Nepa の summarization</u> Nepa の supraoesophageal g. [illegible]
[illegible] feign [illegible]. posterior part [illegible] ganglion [illegible]
[illegible] ganglion [illegible] feign [illegible]

Dixippus (Schleip 1910) [illegible] supraoes. g. [illegible] reflexes [illegible]
feign [illegible] ganglion [illegible] feigning [illegible] nervous control [illegible]
[illegible]. Schmidt (1913) [illegible] pro と meso [illegible]

~~Schmidt (1913)~~ [illegible] 12 [illegible] 120回 [illegible] Katalepsie ハ [illegible] anterior part ハ [illegible] 55頁 [illegible] Katalepsie ハ central n. [illegible] Dixippus ノ [illegible] supraoesophageal g. [illegible] 以上 [illegible] 実験ノ結果ハ [illegible] brain [illegible]

[illegible]

Death feigning ノ origin 及 研究

[illegible] Katalepsie [illegible] mesmeric sleep [illegible] Romanes ハ Insect ノ death feigning [illegible] Hypnotism [illegible] phen. [illegible] origin [illegible] pretty [illegible] useful [illegible] Holmes ハ Thigmotactic response [illegible] intelligent act [illegible] non intelligent and instinct [illegible] Holmes [illegible] Mangold ハ Hypnotismus [illegible] parallel [illegible] Schreckzustand [illegible] muscular Tonus [illegible] thigmotaktische [illegible]

Biological ecological significance

protection [illegible] Coleoptera [illegible] motionless [illegible] enemy [illegible] Dixippus, antlion [illegible] protecting form + color behavior [illegible] protecting [illegible] useful [illegible] 不明 [illegible] protecting [illegible]

Economic significance

~~weevil~~ weevil, sawfly ノ larva etc. [illegible] 利用 [illegible]

~~Lethi~~ Lethisimulation ト Hypnotism

Mangold Hypnotismus [illegible] → Hyponose ノ 特徴 (characteristic symptoms) [illegible]

Ortsbewegung 及 Lagekorrektion [illegible] ノ hindrance (Fehlen); sleep like [illegible] Muskeltonus ト Sinnestätigkeit [illegible] (Lähme [illegible]).

Hypnose ノ 分布 (Mangold)

I. Experimentelle Hypnose durch psychische Hemmung (Suggestions Hypnose)
 beim Menschen
 bei höchststehenden Tieren

II. Exp. Hyp. d. mechanische Hemmung.
 bei Säugetieren, Vögeln, Reptilien, Amphibien.
 bei Krebsen u. Insekten.

III. Natürliche Hyp. durch biologische Reize.

Totstellung bei Krebsen u. Insekten. Katalepsie [illegible] Stabheuschrecken. Mangold [illegible] Tierische Hyp. ト menschliche Hyp. [illegible] künstliche Akinase ト Totstellung [illegible] Reiz [illegible] recover [illegible] Totstellung ハ Reiz [illegible] Zustand [illegible] Reiz [illegible] recover [illegible]

## Schlaf der Insekten

Rau, P. and Rau, N. 1916. The sleep of Insects, an ecological study. Ann. Ent. Soc. Amer. IX, 227–274.

Fiebrig, K. 1912 Schlafende Insekten. Jenaische Zts. Naturw. 48. 315–364

Hempelmann F. 1916. Tierpsychologie. Der Schlaf.

[illegible] Reiz ヲ [illegible] [illegible] day insect ト night insect [illegible] day insect, diurnal ト [illegible] (diurnal, nocturnal, crepuscular) Hymenopt. Lepidop. [illegible] Dip. Coleop. Orthop. Odonata [illegible]

Hymenoptera. Vespoidea — Chalybion caeruleum. Solitary, gregarious
Sceliphron caementarium. Sphex pictipennis. Prionomyx atratum.
Odynerus firmus (sleeps in any place) Polistes spp.
Apoidea — Melissodes obliqua. Apis mellifica. Emphor bombiformis.
Chrysidoidea — Chrysis parpulchra. Siricidae — Tremex columba.
Diptera Proctacanthus milberti (Asilid). Sparnopolius brevirostris (velvet fly). Argyramoeba obsoletum (Bombylid).
Odonata. Libellula pulchella. Anax junius
Orthoptera. Melanoplus femur-rubrum. Dissosteira carolina.
Lepidoptera. Pontia rapae. Nathalis iole. Thecla melinus. Anosia plexippus. Apantesis arge. Haemorrhagia tenuis. Hyphantria cunea.
Coleoptera. Epicauta pennsylvanica. Macrobasis longicollis.

Rau [illegible] 1. [illegible] protective colored place [illegible]
2. protective place [illegible] protective side [illegible]
3. o.p. solitary [illegible] gregarious [illegible]
4. sleep [illegible] (to keep regular hours)

Peckhams ハ Astata bicolor [illegible] nest [illegible]

5. condition, place. time [illegible]
6. vegetable ~~place~~ feeder ハ regular sleeper [illegible] predator ハ irregular.

[illegible] Periplaneta ト Blatta ハ [illegible] Carabid [illegible] social insect [illegible] nervous system [illegible] regular sleeper [illegible] Rau [illegible] Fiebrig [illegible] schlaf ト [illegible] schlaf [illegible] parallelism [illegible]

1. relative immortability. (unbeweglichkeit)
2. unconsciousness. [illegible]
3. external stimulation [illegible]
4. sleep [illegible] behavior [illegible]
5. sleep ノ periodicity アリ.

biological significance [illegible] speculative [illegible]. protective [illegible] i.e. prot. coloration or place [illegible]. 2 atmospheric condition [illegible] catalepsie アリ i.e. continuous ~~[illegible]~~ muscular tonus. [illegible] Fiebrig ハ Hypnose ト Thanatose [illegible] schlaf [illegible] recuperatory process [illegible] schlaf ノ original form [illegible]

# Behavior and Animal Mind

[illegible] behavior [illegible] consciousness [illegible] Inference [illegible] Selbstbeobachtung [illegible] (如: 人間心理学 [illegible] Tierpsychologie [illegible] difficulty [illegible]

1. language [illegible]
2. [illegible]

Tierpsychologie [illegible] methods

A. [illegible]

1. method of anecdote (by Washborn).

[illegible] Lloyd Morgan, Romanes, Darwin etc [illegible]

2. method of experiments.

behavior [illegible] condition [illegible] control [illegible] or [illegible] condition [illegible] experiment [illegible] condition [illegible] control [illegible] abnormal condition [illegible] (今迄の研究 [illegible] normal environment [illegible]). この方法を Insect [illegible] Sir Lubbock (Ants, bees & wasps. V. Graber (sight & smell). J. Loeb (tropism) etc. 是等 [illegible] Jennings (protozoa), Thorndike (Vertebrata) etc [illegible]

[illegible] Versuchstiere [illegible] abnormal condition [illegible] ideal method [illegible]

1. 動物の各 stage の behavior の変化を調べること
2. その動物の natural environment での activity を観察すること
3. 適当な Reiz を与えて normal でない状態にして experiment をすること

これらの方法は観察と実験とに分れます。

B. 外から見て分かる動作をどのように interprete するか 即ち interpretation の問題 [illegible] anthropomorphic [illegible]

i. humanization 人間化. Montaigne, Darwin, Fabre [illegible]

この humanization [illegible]

ii humanization を徹底させた結果 [illegible] mechanism [illegible] automata [illegible] Descartes [illegible] Loeb, Bethe etc [illegible]

以上述べた interpretation の方法は animal mind [illegible]

1 school — all animals have mind. [illegible]

a. parallelists. (Claparède etc)

この学派は animal behavior と mind とは parallel に [illegible] physico-chemical [illegible] psychological method [illegible] behavior [illegible] mind [illegible]

b. interactionism (Wasmann etc)

[illegible] influence [illegible]

tropism の説を立てた。彼は Warmann の instinct の定義を用ひて、Erfahrung によりて instinct を modify する事は、physico-chemically に説明し得べしとなす。

c. Monism (Forel, etc)

mind と body との二つの aspect なりとす。Forel の見方には memory, sense image の association なりとす。彼は食物が food なるかを知るは、過去の経験による。個体の Erfahrung の力なりとなす。Forel の説は auto の研究の結果なりしなるべし。

d. Vitalists (Driesch, etc)

Vitalism によれば animal behavior は意識を伴はず。animal mind は存在せず。これは entelechie による。植物の存在は entelechie なり。body と mind とは二つの distinct な存在なりとす。この説は Interactionism 及び Dualism に反する説なり。

II. school — animals are avoid of mind.

a. mechanists. (Bethe の tropism; Loeb の 'forced movement'; Watson の 'behaviorism' 及び Doflein, etc)

彼等は実験を以て objective method を behavior に応用し、mind の存在を認めざる。Science の目的は説明なり。Loeb の如き automatism は高等な complex phenomena を simplity に帰するものなり。

III. School.

彼等は動物に mind の存在を認めざるなり。動物は animal

に引き続き mind を対象として研究するに過ぎず。in 然るに social life を対象とせざるべからず。この mind の研究は school なり。

この im の説に引き続き注意すべき点は、動物の系統の内容を人間の心理の研究に応用するに過ぎず。この L. Morgan の law of parsimony に反する in の law にして「behavior を interpret するに最も簡単なる説明を求めよ」とあるべし。「behavior を interpret するに最も簡単なる説明を求めよ」とあるべし。故に高等な law が低等の動物に適用せられる in simpler interpretation を得るなり」と云へり。

## Tropistic theory of animal conduct by Loeb

animal conduct は、外界の刺激に対する動物の反応なり。この刺激を Reiz (stimulation) と云ふ。behavior mechanism を説明するには structure と function とを別々に考へざるべからず。動物の bilateral symmetrical structure なること。多くの動物は bilateral symmetry なる事。physiological symmetry の存在する事。in normal condition は sym. に arrange せられたる muskel の tension は左右同じ。又 sym. muskel の比較的強く、比較的弱き muskel の存在と左右同じなり。筋 muskel は peripheral organ なり。endo nerven によりて刺激せられ、normally には動物の locomotion を生ずるなり。Reiz なるものは外界の物体の刺激なり。reizen は muskel を動かすに過ぎざるなり。この場合 Reiz の生ずる結果は、muskel を動かすに過ぎざるなり。Reiz の来るなり。動物は nerven の存在により reizen を受ける。多くの Reiz の存在する muskel の tension は、muskel Tension の gleichgewicht に保たれ。右又は左へ曲がる時は一方の力を失ふなり。'forced movement' なる場合は、太陽を生ずる事の結果。太陽の一方を向かざる circus movement なり。in Reiz の又は存在する場合は、太陽の方向に動物を動かす。

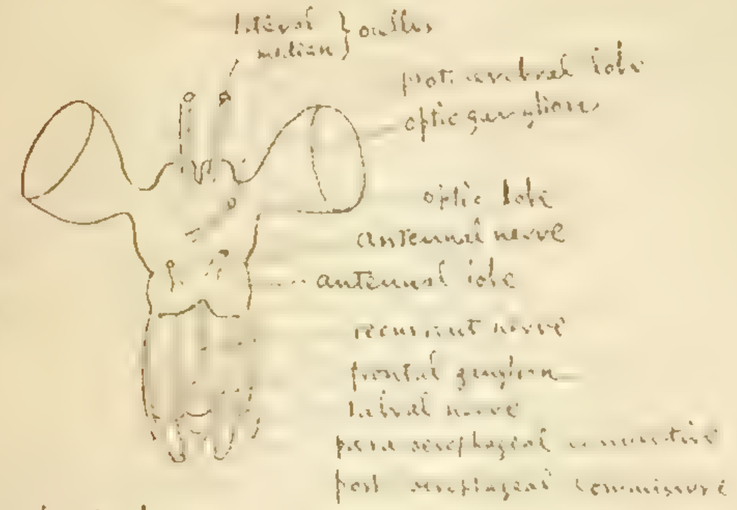
[illegible] movement [illegible] forced movement [illegible] permanent [illegible] 12 [illegible] injury [illegible] Reizbarkeit [illegible] 'Tropism' [illegible] Tropism [illegible] Tropomorphism [illegible] Loeb [illegible] Jennings 'Trial and error' [illegible] Jennings [illegible] 'physiological [illegible] Aristotelics [illegible] teleology [illegible] [illegible] zweckmässig [illegible] [illegible] zweckmässig [illegible] galvanotaxis [illegible] zweckmässig [illegible]

~~[illegible]~~

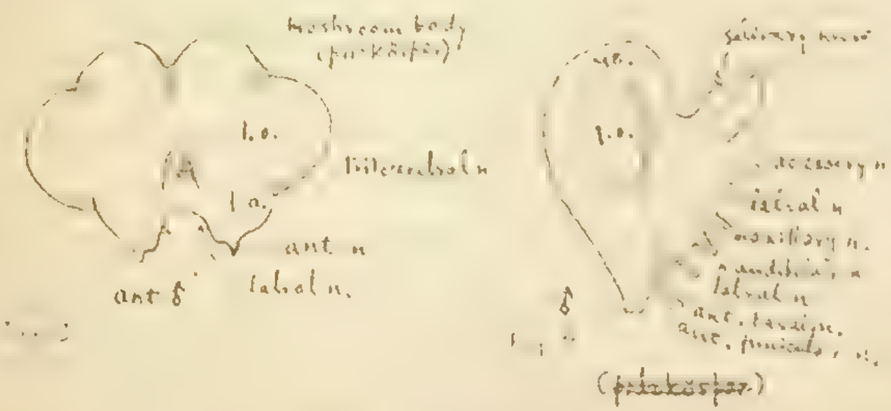
Nervous system I. central nervous system.

[illegible] central nerve system は ganglion, connective, commissure [illegible] [illegible] gehirn [illegible] 脳 [illegible] ie brain [illegible] neuromere [illegible]

Brain { Protocerebrum
Deutocerebrum
Tritocerebrum

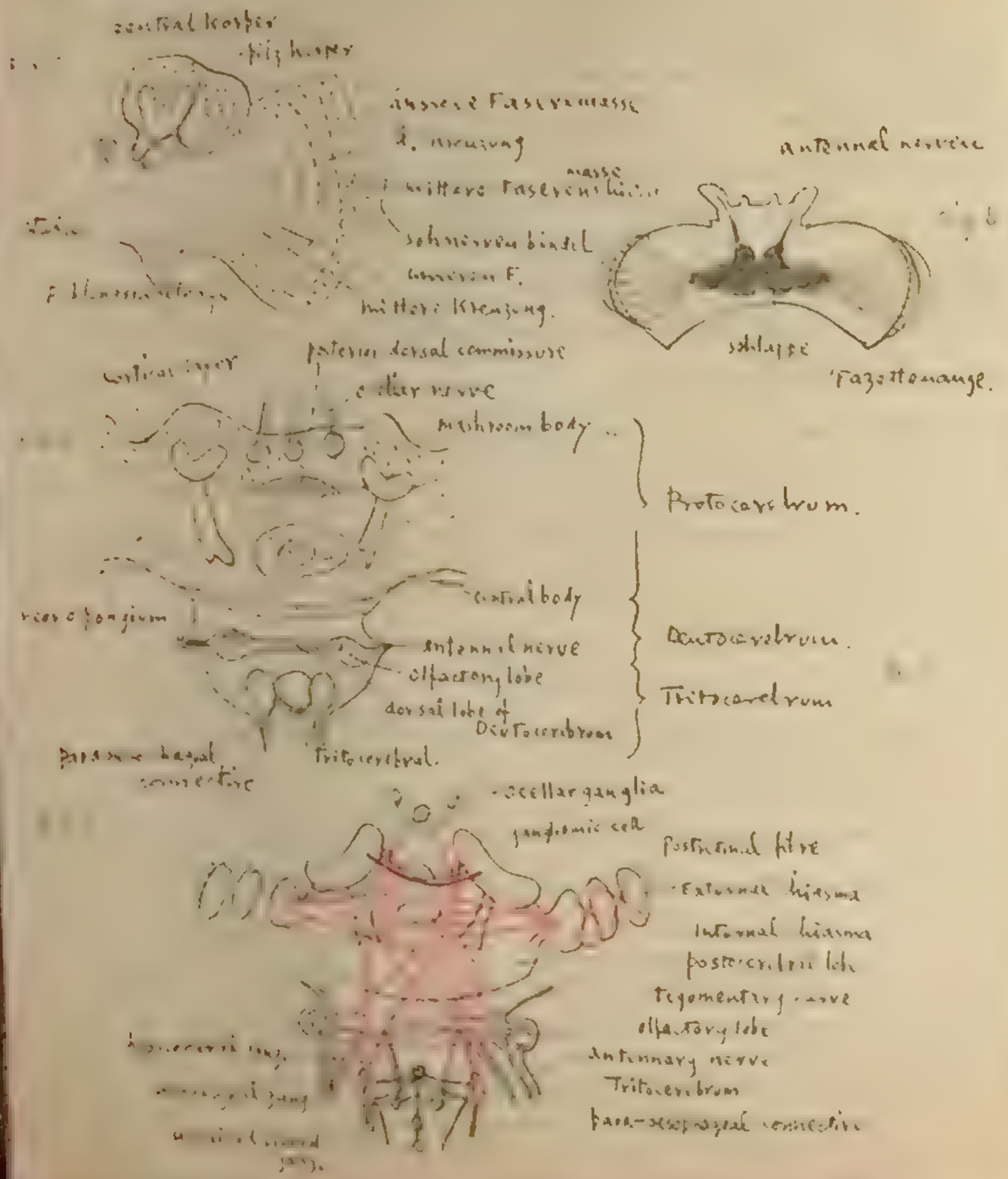



brain of grasshopper




mushroom body [illegible] instinctive behavior [illegible] Hymenoptera, [illegible]

Nov. 26.




Nov. 30.

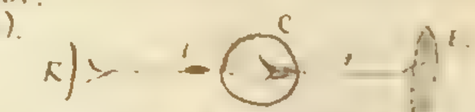
Frontalschnitt durch das Gehirn der Arbeitsbiene.


A – associationselemente.
C – Elemente der Pilzkörper
Kr – stiele und der Kreuzung
com – commissurelemente.
V – Verbindungselemente.
S – sensible Elemente der antennen.

**Reflex Circuits**

Receptor (R) → Adjustor (C) → Effector (E)
(sense organ) (ganglion). (muscle).

Type 1. Simple reflex arc.




2. Chain reflex.

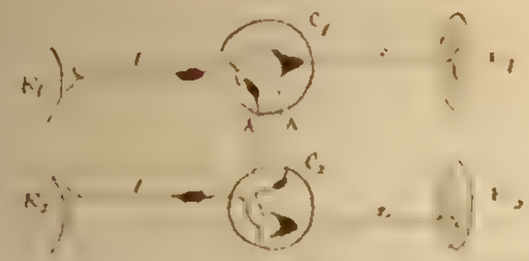

3. complex system.
{ allied reflex.
antagonistic reflex.
with physiological reaction


4. complex reflex.


Fcp – final common path.

3. simpler reflex

Physiological association




A association neuron

[relative index] Hirn と Pilzkörper と の Gehirn index との

| | ♀ | ♂ | Ameisen | Wespen |
|---|---|---|---|---|
| [illegible] | 2.104 | 2.094 | | |
| [illegible] | 2.530 | 2.436 | | |
| [illegible] | 2.605 | 2.345 | | |
| [illegible] | 2.521 | 2.332 | | |
| [illegible] | | 2.455 | 2.526 | 2.592 |
| [illegible] | | | 3.138 | 3.019 |
| [illegible] | | 2.504 | | 3.153 |
| [illegible] | | 2.655 | 3.024 | 2.997 |

[illegible] Pilzkörper mass と [illegible] physiology と [illegible] [illegible] 2 [illegible] solitary Hymenoptera social [illegible]

体と brain との比較

| | Volume of brain | : vol. of body |
|---|---|---|
| Apis | 1 | 174 |
| Formica | 1 | 280 |
| Vespa | 1 | 3290 |
| Dytiscus | 1 | 4200 |

Hirn の Function

1. Sensation の center と [illegible]

2. motor center として [illegible] limit [illegible] の suboesophageal ganglion と [illegible] の coordination の [illegible]. [illegible] coordination [illegible] brain の [illegible] と circus movement [illegible] circus movement [illegible]. suboeso. g. [illegible]

[illegible]

| | Larvae | | Biene | |
|---|---|---|---|---|
| 1. | oberes schlundganglion | ... | 1 | Kopf |
| 2. | unteres " | ... | 2 | |
| 3 | | ... | 3 | Brust |
| 4, 5, 6 | | ... | 4 | |
| 7 | | ... | 5 | Hinterleib. |
| 8 | | ... | 6 | |
| 9 | | ... | 7 | |
| 10, 11 | | ... | 8 | |
| 12, 13 | | ... | 9 | |

Suboesophageal ganglion. mand. max. labium の 3 [illegible] mouth part の [illegible].

Thorax と abdomen の ganglion adult と larvae [illegible] (——— ———) adult の ganglion と larva の [illegible] (Table [illegible]) [illegible] ganglion の function は locomotive organ の movement を [illegible]. [illegible] 2 [illegible] nerve [illegible]

[1st] . segment motor = 7.  [2nd] "  leg = 2.

[illegible] [3rd] nerve が [illegible] wing へ行く. [illegible] leg へ [illegible] sensory + motor [illegible] (autonomy) [illegible] Flügelnerv.

Flügelnerv. . . . Dorsal lobus

Ventral n. d. Flügelnerv.

. . . . . Ventral lobus

Vordere V. Commissure.

Dorsal n. d. Flügelnerv.

Nervus Cervalis

columna ventralis

Flügelnerv.

abdominal ~~additional~~ ganglion  Mg. [illegible] mandibularis [illegible] machilis [illegible]

[illegible] [illegible] 8 add ganglion [illegible]. 全体の [illegible] [illegible]

1. [illegible] abdominal segment ganglion = meta thorax ganglion と [illegible]

2. [illegible] ganglion [illegible] Neuromere [illegible]

[illegible] principal nerve [illegible] segm. muscle tissue [illegible]

function [illegible]. i  segment, respiratory centre [illegible]

ii  coordination, center [illegible]. ([illegible] brain [illegible] autonomy [illegible])

Dec. 7


Medialbündel  über Medialbündel
unter Medialbündel

$M_2$ = motorischen Zellen

$H_2$ = heteronome Commissuralzellen

$HK_2$ = kekheteronome C.

$I_2$ = Zelle mit kurzem Neurit

$T_2$ = ungekreuzte C.

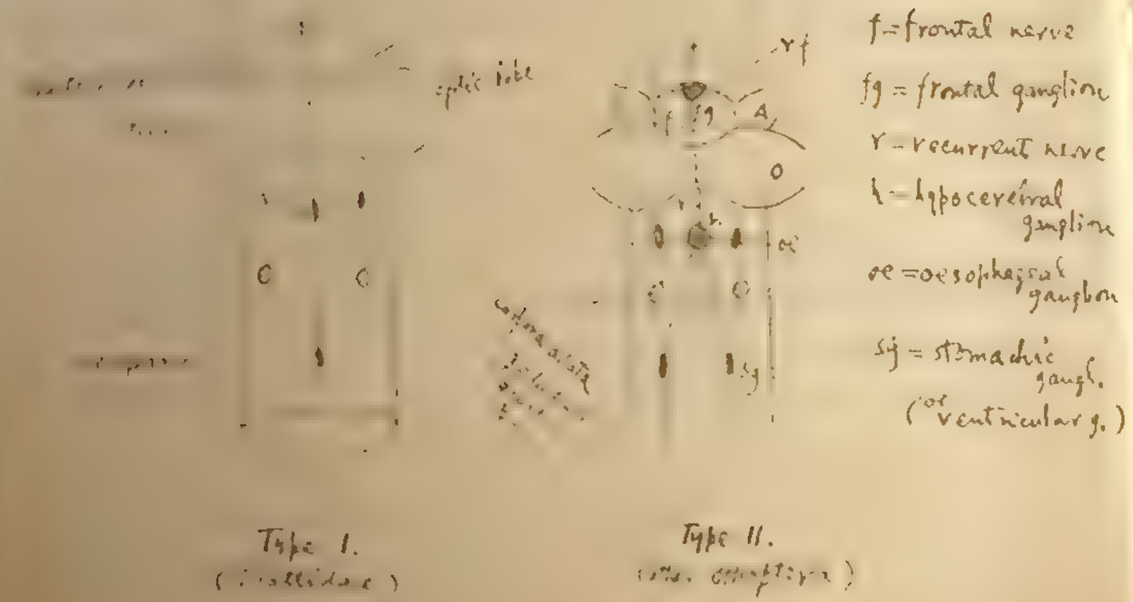
$K_2$ = [illegible] des von Tures [illegible] Riesenzellen

$V_2$ = heteronome C. des sensiblen Neurofils

$A_2$ = Amakrine Zelle des innern Apparates

(nach Zawarzin. Z. f. wiss. Zool. 1924. 122: 324–424)

— visceral or sympathetic nervous system




visceral nervous system

1. oesophageal sympathetic system.

stomgastric s. s.

2. visceral sympathetic system

III. Peripheral sensory nervous system.

1. nerve net

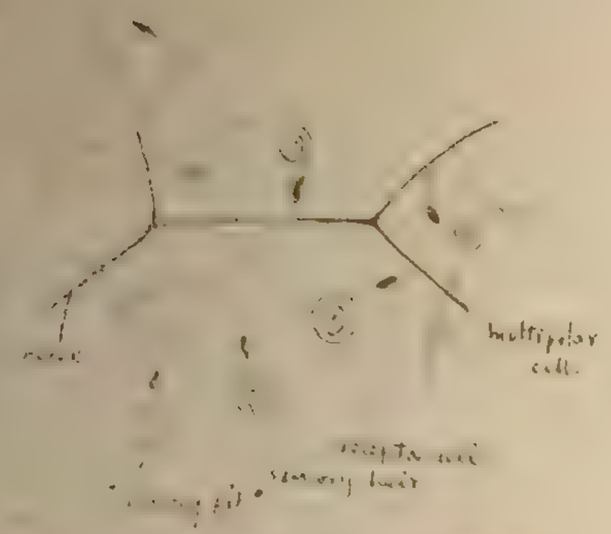
fiber plexus

bipolar nerve cells

tripolar n. c.

multipolar n. c.

sensory hair (sensory organ)




[illegible] ventral ganglion [illegible]

## 2. Sense organs

Chemical senses. [illegible] Geruchsinn, Geschmacksinn, Kontaktgeruchsinn oder Topochemische Fühlersinn. [illegible] chemical senses of the Insect [illegible] quality [illegible] data [illegible]

Geschmacksinn (taste). [illegible] distinct from Dytiscus [illegible] filter paper [illegible] Antennal [illegible] Honey [illegible] antenna, mouth part [illegible] chlorostride [illegible]

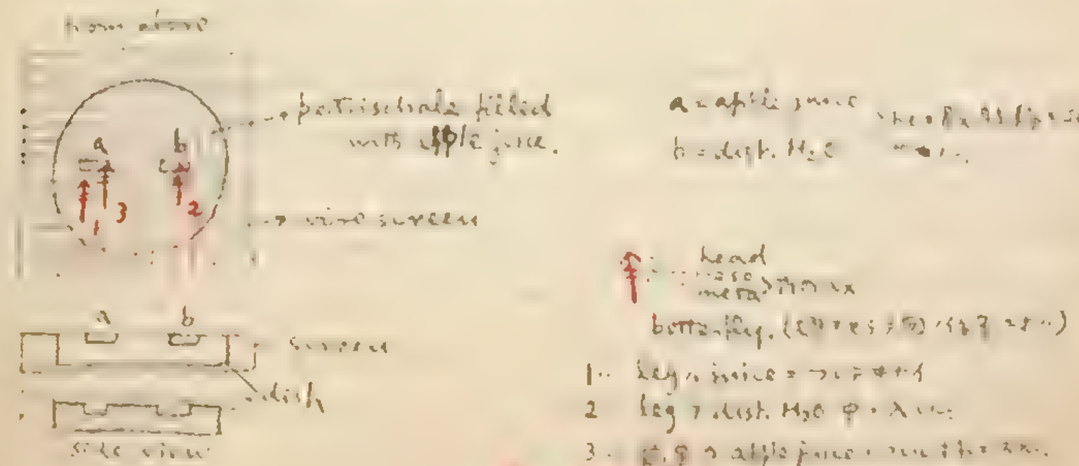

[illegible]

Geschmacksinn [illegible]

Minnich. 1921. An experimental study of the tarsal chemoreceptors of two Nymphalid Butterflies. J. exp. Zool. 33. 173–203.

" 1922. The chemical sensibility of the tarsi of the Red admiral butterfly, Pyrameis atalanta L. J. exp. Zool. 35. 57–81.


[illegible] Food [illegible] butterfly [illegible] chemical [illegible] apple juice [illegible]



Dec. 19. [illegible] — [illegible] Pyrameis atalanta, a butterfly.

| No. exp. | Dev. in days | no. spec. | Position 1 — no response | 1 + Response P | 1 + Response C | 2 — | 2 + P | 2 + C | 3 — | 3 + P | 3 + C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1/2 | 5 | 10 + 2? | 2 | 1 | 11 + 1? | 2 | 1 | 0 | 0 | 15 |
| 2 | 1/2 | 3 | 4 + 1? | 3 | 1 | 8 | 1 | 0 | 0 | 0 | 9 |
| Total | | 8 | 17 | 7 | | 20 | 4 | | 0 | | 24 |
| % | | | 71 | 29 | | 83 | 17 | | 0 | | 100 |

P = partial, C = complete extension

× [illegible] response +: (no Response) [illegible] apple juice [illegible] chemical constitution [illegible] chemoreceptor [illegible]

[illegible] 2 antennae, palpi, forelegs [illegible]

[illegible]

| | − | + | +% |
|---|---|---|---|
| 1 = | 22 | 1 | 4 |
| 2 = | 19 | 4 | 17 |
| 3 = | 8 | 15 | 65. |

[illegible] 1) [illegible] butterfly [illegible] distance chemical stimulation [illegible] proboscis [illegible]. 2) [illegible] in mesoleg + apple juice [illegible] tarsus segment [illegible] receptors [illegible]. 3) [illegible] receptors [illegible] organisms [illegible] distilled water + apple juice [illegible] chemical receptors [illegible] antennae, palpi, [illegible] tarsus contact chemical [illegible]

[illegible] antennae [illegible] Pyrameis [illegible]

[illegible] receptor [illegible] local probe [illegible]

| | − | + P | + C |
|---|---|---|---|
| Imm. anterior to Proboscis | 23 | 0 | 0 |
| 1 × vent. surface left mesotarsus | 6 | 0 | 0 |
| 1 × " " right " | 6 | 0 | 0 |
| 1 × " " left metatarsus | 6 | 0 | 0 |
| 1 × " " right " | 5 | 1 | 0 |
| In contact with V.S. left meso | 0 | 1 | 5 |
| " " " right " | 0 | 0 | 6 |
| " " " left meta. | 5 | 1 | 1 |
| " " " right " | 0 | 0 | 5 |

tibia

tarsus

1 2 3 4 = proximal, distal 4 segments

[illegible] Pyrameis [illegible] cotton soaked in apple juice [illegible] tarsus, chemoreceptor [illegible] sense organ. tarsus [illegible] 1, 2, 3, 4, [illegible] segment [illegible] 1) antennae, palpi, [illegible] 3) tarsus chemoreceptor [illegible] contact chemoreceptor [illegible]. 4) Pyrameis [illegible] tarsus [illegible] chem. rec. [illegible]

Dec. 17.

Pyrameis

Experiment I. Antennae, labial palpi, forelegs not removed

| | 1M saccharose | | Distilled $H_2O$ | | 1M HCl | | M/600 Quinine sulph. | | 1M NaCl | |
|---|---|---|---|---|---|---|---|---|---|---|
| | − | + | − | + | − | + | − | + | − | + |
| no. exp. / no. exc. / Hour | P | P | C | P | C | P | C | P | C | P | C |
| 1 / 6 / 51-55 | 0 | 0 | 12 | 2 | 1 | 9 | 4 | 2 | 6 | 6 | 1 | 5 | 8 | 1 | 3 |
| 2 / 12 / 51-55 | 0 | 0 | 24 | 4 | 3 | 17 | 9 | 3 | 12 | 9 | 3 | 12 | 11 | 3 | 10 |
| 3 / 6 / 53-55 | 0 | 0 | 12 | 1 | 1 | 10 | 1 | 2 | 9 | 2 | 0 | 10 | 3+1? | 2 | 6 |
| total: A | 0 | 48 | 7 | 44 | 14 | 34 | 17 | 31 | 23 | 25 |
| Percent | 1 | 100 | 15 | 85 | 29 | 71 | 34 | 65 | 48 | 52 |

Pl = period of hesitation, P = partial extension, C = complete extension of proboscis

Experiment II. Antennae, labial palpi, forelegs removed

| | 1M saccharose | | $H_2O$ | | 1M HCl | | M/600 Q sulph. | | 1M NaCl | |
|---|---|---|---|---|---|---|---|---|---|---|
| | − | + | − | + | − | + | − | + | | + |
| totals | 1 | 20 | 5 | 16 | 7 | 14 | 8 | 13 | 1 | 20 |
| % | 5 | 95 | 24 | 76 | 33 | 67 | 38 | 62 | 5 | 95 |

NaCl の operation の結果は不明. 即 NaCl 丈は 3 倍の出現率 individuality が

[illegible] 18. scale organ の removal は [illegible] 全体の % に [illegible]

又 [illegible] Temperature の [illegible] 考へなければ [illegible]

conclusion

1. Pyrameis の in contact chemical stimulation に対する positive response [illegible] 50 倍 [illegible]

2. tarsus organ の [illegible] Pyrameis の 1M saccharose, dist. water の [illegible] 2 1M HCl, M% Quino sulp., 1M NaCl の dist. water に 対する 1M saccharose の [illegible]

3. [illegible] tarsus organ [illegible] stimulation [illegible]

4. 1 mol NaCl の [illegible] response [illegible]

5. stimulus [illegible] forelegs の [illegible] sense organ [illegible]

6. tarsal organ は ~~osm~~ osmotic organ [illegible] chemical water [illegible]

蝶類 Pyrameis

| | A 1 | A 2 | A 3 | B 1 | B 2 | B 3 | B 4 |
|---|---|---|---|---|---|---|---|
| no. | no. swab in contact with tarsus | Dry swab in contact with 1 tarsus | Dist. $H_2O$ swab in contact with 1 tarsus | | | | 1M saccharose swab in contact with 1 tarsus |
| | − / + p c | − / + p c | − / + p c | − / + p c | − / + p c | − / + p c | − / + p c |
| 1 | 8 / 0 0 | 8 / 0 0 | 0 / 1 7 | 8 / 0 0 | 8 / 0 0 | 8 / 0 0 | 0 / 1 7 |
| 2 | 8 / 1 0 | 6 / 2 0 | 1 / 2 5 | 8 / 0 0 | 8 / 0 0 | 7 / 1 0 | 1 / 1 6 |
| 3 | 8 / 0 0 | 7 / 0 | 0 / 1 7 | 8 / 0 0 | 8 / 0 0 | 7 / 1 0 | 0 / 8 |
| total | 24 / 0 0 | 21 / 3 6 | 1 / 4 19 | 24 / 0 0 | 24 / 0 0 | 22 / 2 0 | 1 / 2 21 |
| T. W. R | 0 | 1.5 | 21 | 0 | 0 | 1 | 22 |
| % E | 0 | 6.3 | 87.5 | 0 | 0 | 4.2 | 91.7 |

A: five days old butterfly no feeding after hatching. swab [illegible]
B: " dist. water [illegible]

T.W.R. total weighted response. complete 1, partial 0.5 [illegible]

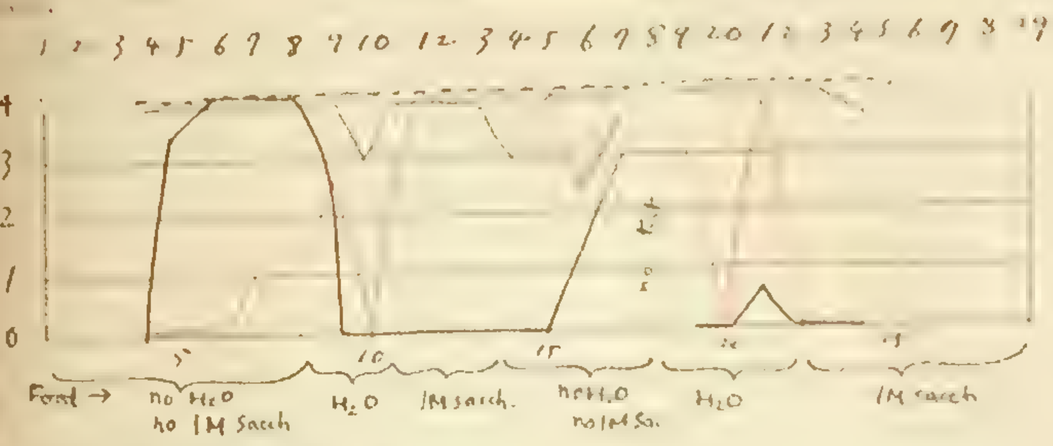
[illegible] A: 2 [illegible] $1 \times 0 + 0.5 \times 3 = 1.5$ (T.W.R) [illegible]

i.e. percentage of effectiveness

[illegible] $\frac{1.5}{24} \times 100 = 6.3\ \%$

days after imagination

Chemoreception of Pyrameis




----- = 1M saccharose.

—— = dist. water

-- = 2M NaCl

—— = $\frac{M}{10}$ quinine hydrochloride.

Relation between the nutritional condition [illegible]

conclusion. 1. Pyrameis [illegible] cosila [illegible] dendropelpt [illegible]

2. [illegible] Proboscis [illegible]

3. [illegible]

4. [illegible] nutritional condition [illegible]

4. [illegible] substances [illegible] various organs [illegible]

[illegible] ie dist. wat.; 1mol saccarose; 2mol NaCl: [illegible] $\frac{1}{10}$mol quinine hydrochloride, dist. wat. [illegible] 2mol NaCl [illegible] 1mol [illegible]

5. dist. wat. [illegible] nutritional condition [illegible]

6. 1mol. sacc; 2mol. NaCl; [illegible] 1mol quinine hydrochloride [illegible] nutritional condition [illegible]

7. 1mol sacc. 37-[illegible] 50% test animal.. 100%, さらに [illegible] 1/10M quinine hydrochloride [illegible] 84.7%, 2mol NaCl 37-[illegible] 51.6% [illegible]

8. tarsi organ.. contact chemoreceptor [illegible] substances discrimination [illegible]

threshold concentrations of saccharose solution, under varying nutritional conditions in Pyrameis.

| No. | I period of strict inanition (A) | I period of water diet (B) | I period of saccharose diet (C) | II (A) | II (B) | II (C) |
|---|---|---|---|---|---|---|
| 10 | not tried | M/100* | M/10 | M/50 | M/12,800 | M/10 |
| 12 | " | M/200 | " | " | M/400 | |
| 13 | M/100 | M/3,200 | " | M/100 | M/1600 | M/10 |
| 22 | not tried | not tried | M/100 | M/400 | M/3200 | M/100 |
| 24 | " | M/12,800 | | | | |

* M/[illegible] [illegible] if most [illegible] M/12800 [illegible] saccharose sol. [illegible] M/5 [illegible] 250 [illegible] [illegible]

Jan. 21.

味覚 = food taking [illegible] 味覚 [illegible]

Will .. wasp [illegible] Zucker [illegible] powdered [illegible]

Forel .. 1) ants [illegible] honey + morphine / honey + strychnine [illegible]

2) ants [illegible] honey + phosphorus [illegible]

[illegible] Gr. aurilius, 1905. Brown tail moth larva. [illegible] tannin [illegible] select [illegible] Stellaria media [illegible] tannin [illegible] tannin [illegible] i tannin [illegible] milled [illegible] [illegible]

Verschaffelt, 1910. Pieris rapae & P. brassicae [illegible] mustard oil allyl isothiocyanate $CS:NC_3H_5$ [illegible] m. oil [illegible] glucoside [illegible]

$$\{ \underset{\text{sinigrin}}{C_{10}H_{16}NS_2KO_9} + H_2O = CS{\cdot}NC_3H_5 + C_6H_{12}O_6 + HSO_4 \}$$

myrosin [illegible]

Verschaffelt [illegible] Prophoros padi [illegible] Rosaceae [illegible] amygdalane $C_{20}H_{27}NO_{11}$ [illegible] glucoside [illegible]

Geruchssinn = olfactory sense [illegible] chemical sense [illegible]

[illegible]

(3 [illegible] quality [illegible])

Morphological

Packard 1868 Text Book. Berlese 1909 Gli Insetti

Zander 1912 Schröder's Handbuch

Mc Indoo 1914. olfactory sense of Orthoptera

Physiological

Bethe 1903. Winterstein's Handbuch Hdb. d. Vergl. Physiol.

Snodgrass 1914 Olfactory sense of Insects.

Behavior

Forel 1910 Das Sinnesleben der Insekten.

Parker 1916. The The Animal Mind.

Jordan 1918 Forced Movements.

Schneirla 1916 Handbuch der Physiologie der Niederen Sinne Bd. I.

I adult's food = chemotropism (olfaction ? [illegible]) で [illegible] 実験

1. Hauser 1880. silphus [illegible] Calliphora [illegible] (anthonomus [illegible])

2. Barrows 1907 Drosophila — ripe fruits [illegible]

3. Lodge 1915 Musca domestica [illegible] various food substances (casein, sugar, lanolin) [illegible] 2gr or 2cc in 20cc of $H_2O$ [illegible]

conclusion [illegible] a. common food substance = attract [illegible]

b. sodium iodate (poison), strychnine [illegible]

c. mineral oil [illegible] attract [illegible]

d. volatile oil [illegible] attract [illegible]

e. alcohol [illegible] positive [illegible] i.e. most attractive [illegible] K-chlorate, K-permanganat, Na-iodat, Na-sulfat etc.

4. Wheeler, 1918. ants (Trophallaxis) [illegible] worker [illegible] larval secretion = attract [illegible] i.e. adult [illegible] larval food = attractive [illegible] larva [illegible]

5. Adolph. 1920. Drosophila. Barrows [illegible] Banana [illegible] food [illegible] banana [illegible] bacteria, [illegible] i.e. banana [illegible] medium [illegible] larva [illegible] bact. + yeast [illegible] adult [illegible] fermentation product [illegible] alcohol [illegible] (主 [illegible] banana [illegible]

6. Baumberger, 1920. [illegible] insect [illegible] bac. yeast, protozoa etc [illegible] Adolph [illegible]

7. Richardson, 1916. housefly. $NH_4OH$ gas [illegible] attract [illegible] larva [illegible]

8. Crumbs & Lyon, 1921. housefly. ammonia or $CO_2$ + acetic acid [illegible] more attractive [illegible]

[illegible] cap. [illegible] larva [illegible] adult [illegible] food [illegible]

II. sexual attraction.

1. Fabre: — Bombyx sp. on oak. [illegible] sp. [illegible] olfactory [illegible]

2. Riley: — saturnia carpini. [illegible] marked [illegible] attract [illegible]

3. Toxi — [illegible]

4. Howlett. 1912, 1916: — Dacus (実験.) [illegible] oil of Citronella [illegible] most-attractive [illegible].

5. Fabre [illegible] Lasiocampa quercus の一匹の中に 50–60 の [illegible] の [illegible] colour [illegible] (1. 実験)

6. [illegible] 1914. — Ceratitis capitata (mediterranean fruit fly). [illegible] female [illegible].

[illegible] の [illegible] colour [illegible] attract [illegible] (Henning, [illegible] Gesch. 227–290 より).

II. [illegible] mating [illegible] social insect [illegible] recognition [illegible]

[illegible] C. [illegible] Cooper (1900) の honey bee の研究 [illegible] odour を識別する.

1 individual odour. [illegible]

2 [illegible] o. [illegible] nest [illegible] 一つの queen [illegible]

3 [illegible] hive o. [illegible]

4 brood [illegible]

5 wax o. glandular excretion [illegible] gland [illegible]

6 honey o. [illegible]

7 [illegible] o. [illegible] 1, 2, 7 [illegible]

McIndoo (1914) [illegible] honey bee [illegible]

1 hive odour. 2. brood o. 3. honey o. 4. wax. o.

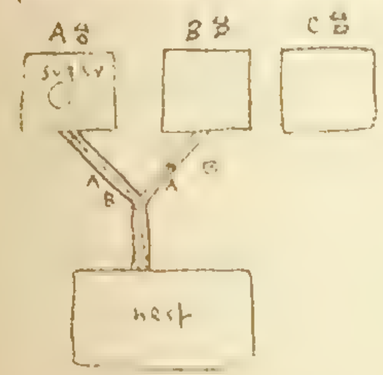
[illegible] worker, drone, queen [illegible] 1 [illegible] worker [illegible] young queen [illegible] old one [illegible] young [illegible] old [illegible].

実験の方法 (1) hive odour の研究 実験) —— [illegible] hive [illegible] walker [illegible] walker [illegible] cage の中に [illegible] colony [illegible] cage [illegible] group [illegible] [illegible]

Ant の研究. ant に [illegible] colony odour, individual o. [illegible]

[illegible] larva と adult [illegible] ant [illegible]

1. John Lubbock の実験. —— [illegible] ant [illegible]

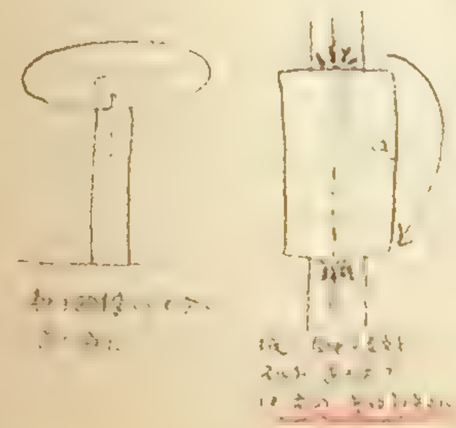



[illegible] A [illegible] B [illegible] A, B C [illegible] sugar [illegible] ant [illegible] sugar [illegible] [illegible].

2. Tangnay の実験 (1912) [illegible]

member の recognition [illegible] ant [illegible] dilute alcohol [illegible] nest [illegible] nest mem. [illegible] [illegible] body [illegible]

species [illegible] odour [illegible]



Mc Indoo の文献 1914. J. exp. Zool. 16. 366-346.

Mc Indoo の実験を一々行ふまゝ述べる訳ッタ. 少数の人間ハ特ニ honeybee の olf. sense ヲ信ジタ ヲ

1. 〔artificial Duft ヲ与ヘ Honigbiene の Empfindlichkeit ヲ試験シタ結果ニ疑ヒアリ〕.

2. 〔[illegible] の sense の localization ヲ疑ヒアリ〕.

3. 〔[illegible] chemicals ニ対スル〕

essential oil { oil of peppermint
thyme (reaction time)
wintergreen (reaction time)

bee food { honey
pollen
comb
pollen from old comb.

aromatic plants { flowers of honey suckle
leaves of penny royal
" " spermint
" " scarlet sage

bee sting. 〔[illegible]〕

method 〔[illegible]〕 glass 〔[illegible]〕 pile 〔[illegible]〕 pile 〔[illegible]〕 1st response ヲ record スル. (1st resp. トハ [illegible] antennae ヲ [illegible]) reaction time ヲ stop watch デ測ル.

第一回 [illegible] heads. 之ヲ record ヲ [illegible] 263 heads. abnormal ハ [illegible]. reaction time — 3 sec mean 2.3 sec. no. of reaction 37 heads.

131 peppermint ヲ用ヒタ worker bee ヲ [illegible]

| | |
|---|---|
| 13 heads | suddenly moved away |
| 6 | moved slowly away. [illegible] |
| 4. | antenna ヲ少シ [illegible] moved away |
| 2. | suddenly jump up (= enemy に対する attitude) |
| 2. | [illegible] antenna ヲ [illegible] |
| 1 | head ヲ [illegible] case / flower に対シ antenna ヲ [illegible] |
| 1 | [illegible] antenna ヲ [illegible] |
| 1 | [illegible] |
| 1 | [illegible] |

Fig. 1. lost track.

| | moved away | | reaction time |
|---|---|---|---|
| * peppermint. | 87 % | — | |
| * thyme | 89 | — | |
| * wintergreen | 6 | — | |
| * honey | 29 | | |
| * pollen. | 45 | | worker 3.29 sec. |
| honeysuckle. | 78 | | drone 2.86 sec. |
| * penny | 63 | — | |
| spear | | — | |
| S. S. | 69 | — | |
| B. sting | 4 | | |

[illegible] average reaction time; workers 3.4 sec; drone 2.9; queen 4.9.

summary.

1. honeybee の [illegible] acute [illegible]. 2. drone [illegible] queen [illegible].

3. [illegible] odour [illegible].

localization of olfactory sense organs.

1. mutilation [illegible] antennae [illegible] recognition [illegible] communication [illegible] life [illegible] antennae [illegible] segment [illegible]: [illegible] segment [illegible] behavior [illegible] abnormal [illegible] life span. [illegible] antennae [illegible] communication [illegible] life [illegible] antennae / shape [illegible] selection [illegible]: — [illegible] "Scouts" [illegible] shape [illegible] 3,3 [illegible] — [illegible] operation [illegible] behavior [illegible].

i. [illegible] peppermint, thyme, wintergreen [illegible] reaction time 4.6. (normal 2.3)

ii. [illegible] 1 pulled off, [illegible].

oil, alone [illegible].

workers.

| | |
|---|---|
| 2 joints missing | 15 sec. |
| 4 | 24 |
| 5 | 27 |
| 6 | 25 |
| 7 | 25 |
| 8 | 35 |

2. burnt off, cut off [illegible] above three oil [illegible] 4 sec. (further burnt off) (22 ones strong) recovering abnormality [illegible] cut off [illegible] motion [illegible] beec. normality [illegible] 2. joints [illegible] [illegible] 2 covers [illegible] abnormality [illegible] antennae - olfactory organ [illegible] burnt off [illegible] 4 sec; glued 2.9; intact (normal) 2.6 [illegible] reaction time [illegible] abnormal condition [illegible] response [illegible] 3. [illegible] antennae [illegible] assist [illegible]

recording for olfactory sense organ

Reaction time

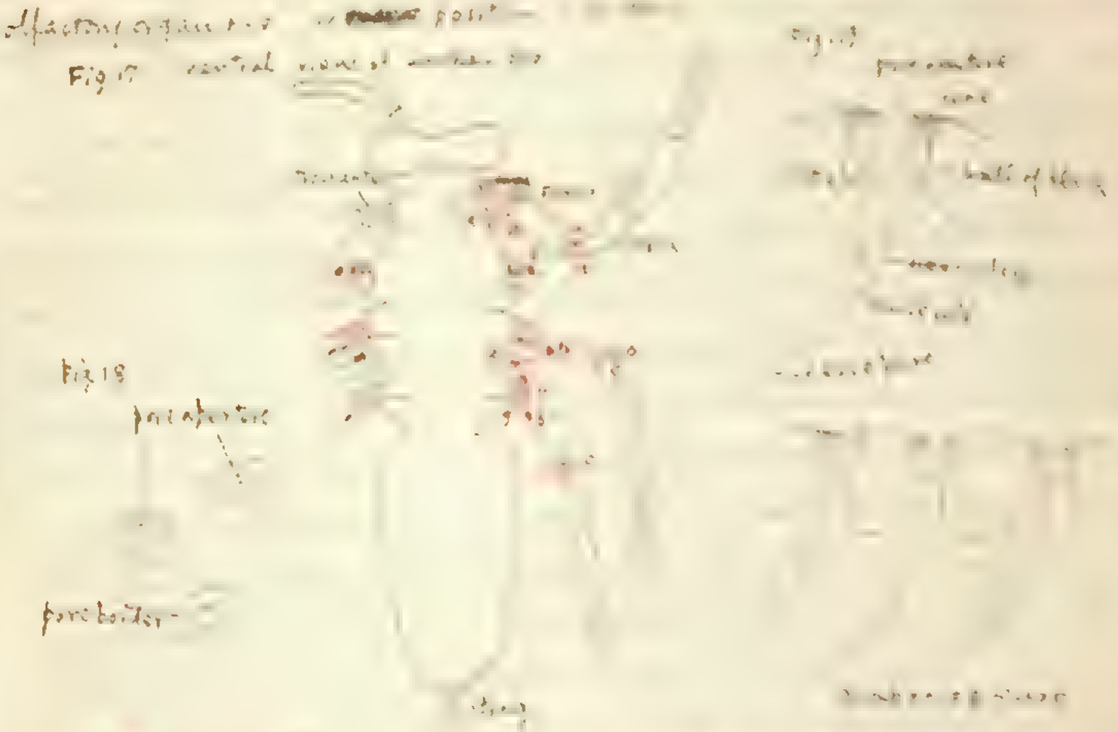
| antennae | Pepp. | thy. | Win I. | aver. |
|---|---|---|---|---|
| intact | | | | 2.6 |
| burnt off | 3.5 | 4.5 | 4.3 | 4 |
| left cut off | 5.2 } 5.0 | 4.3 } 4.2 | 4.8 } 4.7 | 4.6 |
| right " " | 4.8 } | 4.1 } | 4.6 } | |
| glued | 3.1 | 3. | 2.8 | 2.9 |
| maxillary palpi removed | 2.2 | 3.7 | 4.0 | 3.3 |
| proboscis removed | 2.6 | 3. | 3.2 | 2.9 |
| mandibles " | 2.6 | 3.3 | 4.6 | 3.5 |
| buccal cavity coated with flour paste | 2.55 | 2.75 | 2.75 | 2.68. |

[illegible] treatment [illegible] crude [illegible]

= Oil [illegible] pure [illegible] abnormal condition [illegible] back [illegible]

Methodo [illegible] olfactory organs [illegible] point [illegible]

Fig. 17 ventral view of [illegible]




1–17 [illegible] olf. pores in wing base, tarsus, tibia [illegible] 2 pores dorsal side [illegible] in cylinder [illegible] 2 pores [illegible] cell [illegible] Methodo [illegible] olf. pores [illegible] = 1857. Hicks [illegible] 20 [illegible] Methodo [illegible] olf. pores [illegible]

[illegible]

Table 14. honeybees.

| | no. of pores on all wings | " on legs | on sting | average total |
|---|---|---|---|---|
| drone | 1995 | 606 | —(stingless) | 2604 |
| worker | 1510 | 658 | 100 | 2268 |
| queen | 1310 | 450 | 100 | 1860. |

[illegible]

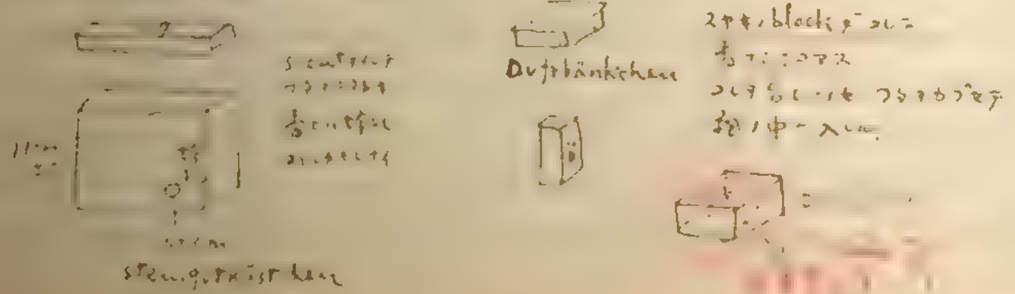
Frisch

von Frisch, Karl. 1914. Über den Geruchssinn der Biene und seine biologische Bedeutung. Zool. Jahrb. all. Abth. 34 37.

method honeybees [illegible] Duft (scent) = [illegible] 17.1% sugar water [illegible] food [illegible] scent [illegible] associate [illegible]. [illegible] Biene [illegible] scent [illegible] scent [illegible] [illegible]. [illegible]

[illegible] 3 groups [illegible] is.

1. [illegible] oils 'enfleurage a froid' (paraffin [illegible] paraffin [illegible])
   acacia, terminum, citrus, reseda, rosa, polianthes.
2. [illegible] oils — distillation [illegible]
3. synthetic product.






second [illegible]

Table 15 [illegible]

| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|
| [illegible] | 0 | 0 | [illegible] | 0 |
| [illegible] | [illegible] | [illegible] | [illegible] | 0 |
| [illegible] | 0 | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | 39 | [illegible] |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

[illegible]

Table conclusion [illegible] 1. [illegible] flower scent [illegible] sensitive [illegible]
2. [illegible]

[illegible]

1. [illegible]
2. weaker, weaker [illegible]
3. paraffin [illegible] paraffin [illegible]

Das [illegible] der Biene [illegible] Düfte [illegible] (Bd. 1914)

| [illegible] | [illegible] | lavender | [illegible] | [illegible] |
|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | 133 | [illegible] |

[illegible] 1. bee は [illegible] 十分の色 [illegible] 者の区別に使. [illegible] に

明かに花の特徴に関係する.

2. 十分の者と之に近い色との明瞭な distinguish に使ふ者は不明.

[illegible]

| [illegible] | P.M. | spanisch | Bergamotte | cedrat | origen blüten | verbena |
|---|---|---|---|---|---|---|
| [illegible] 9.6 6.10 | 26 | 10 | 3 | 3 | 0 | 0 |
| 11 | 32 | 17 | 9 | 6 | 3 | 0 |
| 12 | 42 | 19 | 8 | 7 | 4 | 0 |
| 13 | 53 | 15 | 8 | 3 | 6 | 0 |
| 14 | 28 | 11 | 3 | 1 | 6 | 0 |
| 15 | | | | | | |
| Summe | 161 | 75 | 31 | 20 | 7 | 0 |

[illegible] bee は [illegible] 者の [illegible]. (但し此事は [illegible] honeybee が人間に [illegible] insin [illegible] 事も [illegible] 大事なる [illegible])

[Farbe und Duft] 花の特徴には色と香とあり. [illegible] 色と香との [illegible] 時の [illegible] に [illegible] Reiz [illegible] 'Konkurrenzversuch' とした.

Blau と Resida (香) [illegible] 15系.

| gelb Diftlos | Blau Öl | Gelb Öl | Gelb Resida |
|---|---|---|---|
| 0 | 19 | 2 | 63. |

[illegible] 香は bee [illegible] 色のみ [illegible] 色と香の [illegible] [illegible] Frisch [illegible]



更に色と香との combinate の実験は15系.

| | G. Öl | G. Öl | G. Öl | Blau Resida |
|---|---|---|---|---|
| 2/8 1914. | 0 | 0 | 0 | 146 |
| 3/8 〃 | B. Öl 28 | G. Resida 17 | G. Öl 0 | G. Öl 1 |
| 4/8 | G. Öl 0 | G. Öl. 0 | G. R. 54 | B. Öl 9 |

[illegible] attract [illegible]

[illegible]

Frisch の更に field 式の実験の試み [illegible]

色 gelb. 香 orangeblüten

1米 35米 Farbe : Duft = 1 : 26

色 gelb 香 Fenchel süss [illegible]

[illegible] 色の方に attract [illegible] 次に color [illegible] 変化) 次に色を inside of box に [illegible] 色 [illegible] 関係 [illegible] 上の色 color [illegible] response [illegible] duft [illegible] 強さを示す. [illegible] bee は色と香と何れを [illegible]

IV. Das Gedächtnis der Biene für Duft u. Farbe.

色と香とを [illegible] 試験 Blau と Tuberose [illegible] bee は色の方を Blüten Duft [illegible]

V. Haben 'geruchlose' unscheinbare Blüten, welche von Bienen stark besucht werden, einen für uns nicht wahrnehmbaren Duft?

Weinblüten (ぶどう, [illegible]). Heidelbeere (ほうき). Tuberose [illegible]

[illegible] 香 [illegible] bee [illegible]

Reside, phlor [illegible] all positive [illegible].

Conclusion bei [illegible] sense [illegible]. [illegible]

[illegible] erkennbar [illegible]

[illegible] mit.

III. Die Riechschärfe (das minimum perceptibile)

[illegible] paraffin oil [illegible]

i Tuberose . paraffin 1:1
1:10
1:50 [illegible]
1:100 [illegible]
1:200 unerkennbar.

Feb. [illegible]
Syphonat.

w-Bromstyrol $C_6H_5-CH=CHBr$ (Hyazinthenduft) [illegible]

| | B | B | dl | dl | dl | dl | dl | Verdünnung |
|---|---|---|---|---|---|---|---|---|
| B.2. | | | | | | | | B P |
| 13/8 1917 1 12-17 | 181 | 98 | 1 | 3 | 4 | 2 | 0 | 1 : 0 |
| 14/8 9 [illegible]-09 | B+P 63 | B+P 38 | 1 | 5 | 4 | 30 | 3 | 1 : 200 |
| 2 55-3 02 | 54 | 96 | 2 | 0 | 0 | 1 | 3 | 1 : 500 |
| 1 15-20 | 91 | 2 | 19 | 9 | 0 | 0 | 4 | 1 : 2000 |
| 2 19-24 | 67 | 0 | 4 | 7 | 2 | 3 | 1 | 1 : 20000 |

[illegible]

[illegible] Methylheptenon $(CH_3)_2C=CH_2-CH_2-CO-CH_3$

| | m | m | dl | dl | dl | dl | dl | V | |
|---|---|---|---|---|---|---|---|---|---|
| 3/9 1917 11 | 42 | 32 | 3 | 3 | 0 | 2 | 0 | 1 : 0 | Nach Dressur auf den intensiv Duft |
| 4/9 1917 10 22-9 | 2 | 55 | 1 | 17 | 0 | 5 | 5 | 1 : 2000 | Dl : D = 1 : 5.1 |
| 10 [illegible]-15 | 9 | 6 | 3 | 1 | 0 | 26 | 0 | 1 : 20000 | Dl : D = 1 : 1.1 |
| 3 19-22 | 23 | 100 | 0 | 2 | 1 | 58 | 0 | 1 : 2000 | Dl : D = 1 : 9.0 |
| 2 55-200 | 12 | 42 | 3 | 4 | 89 | 1 | 0 | 1 : 20000 | Dl : D = 1 : 1.0 nach Dressur auf den schwachen Duft |

~~nach D.~~

∴ 20000 [illegible] 12/9 17 = Limit [illegible].

Conclusion 1. [illegible] intensiv [illegible] Limit [illegible] (D) [illegible]. [illegible]

[illegible] grenzwert [illegible])

2 [illegible]

### VIII. Versuche mit Mischgerüchen.

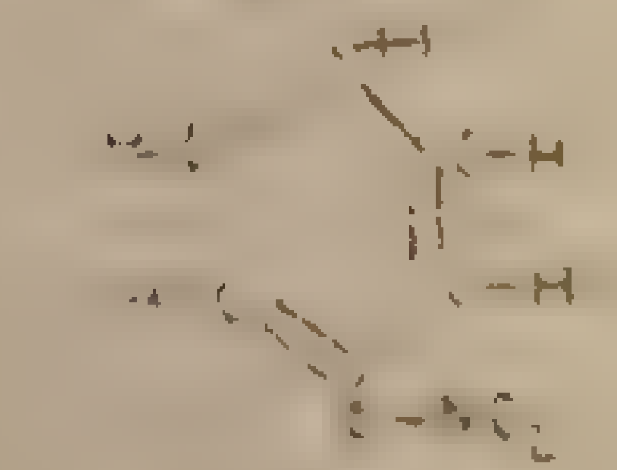
[illegible] Tuberose + Jasmin, Bromstyrol + Methylheptenon. combination [illegible]

[illegible]

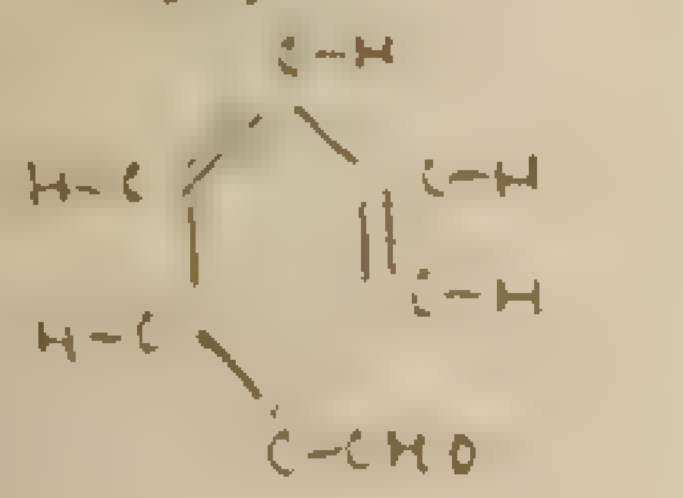
[illegible] component of mixture [illegible]

2. Versuche mit Riechstoffen, die bei chemisch verschiedener Zusammensetzung ähnlich duften.

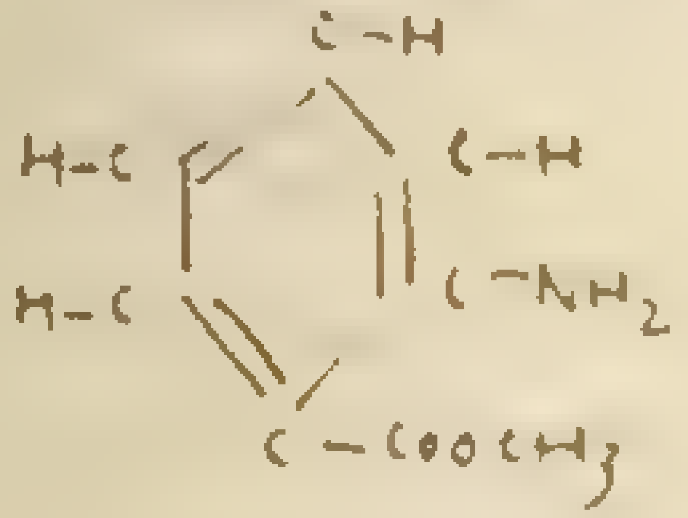
Mirbanöl
$C_6H_5NO_2$



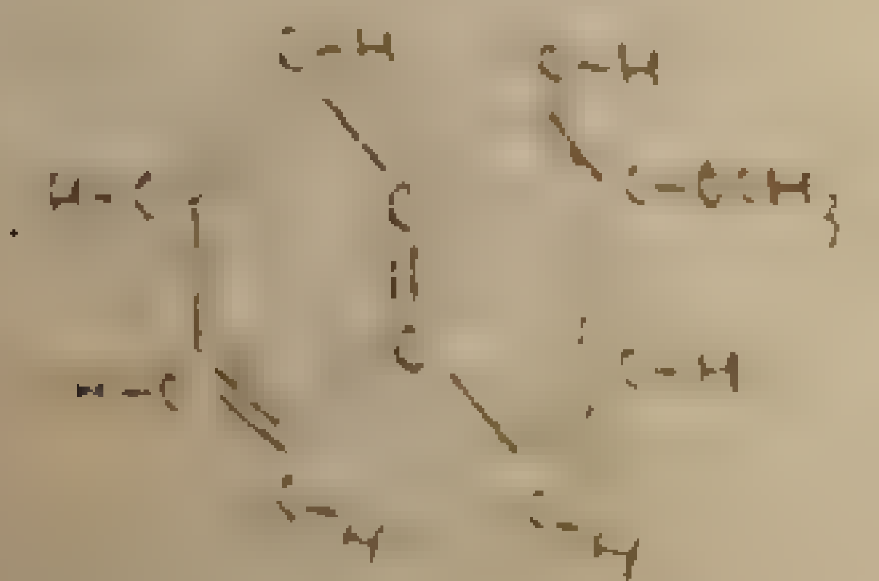
Bittermandelöl
$C_6H_5CHO$



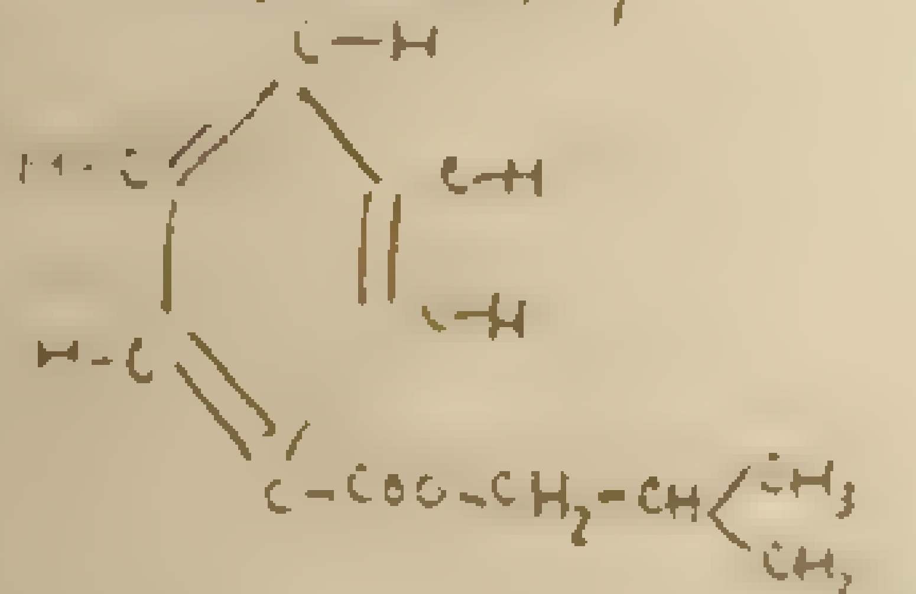
Anthranilsäuremethylester
$C_6H_4(NH_2)CO \cdot OCH_3$
(orange [illegible])



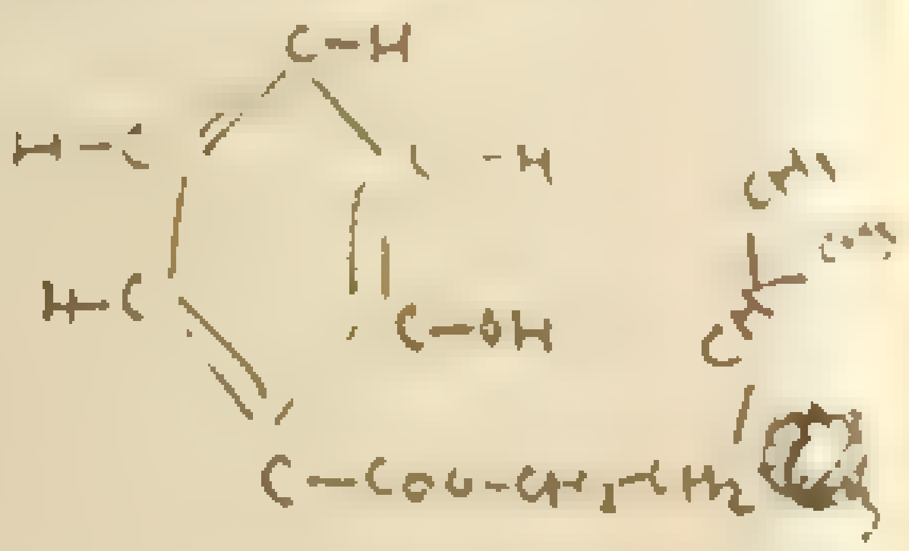
Nerolin II



Isobutylbenzoat
$C_6H_5-COO-C_4H_9$



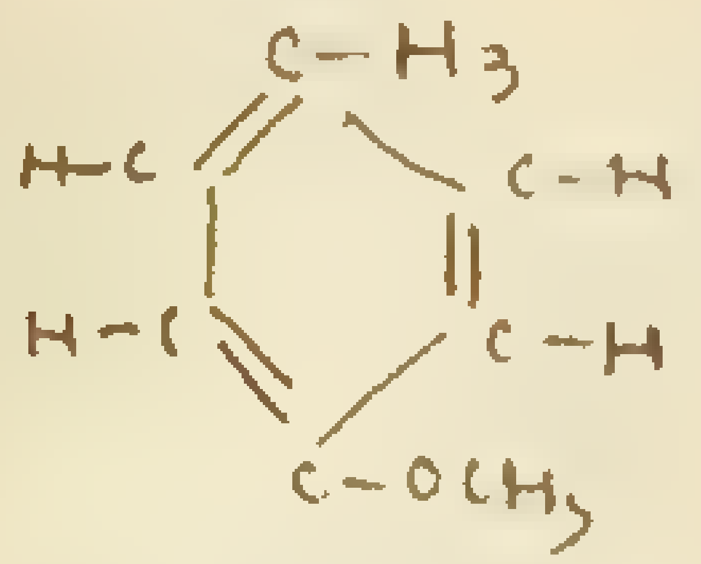
Salicylsäureamylester
$C_6H_4(OH)-COO-C_5H_{11}$



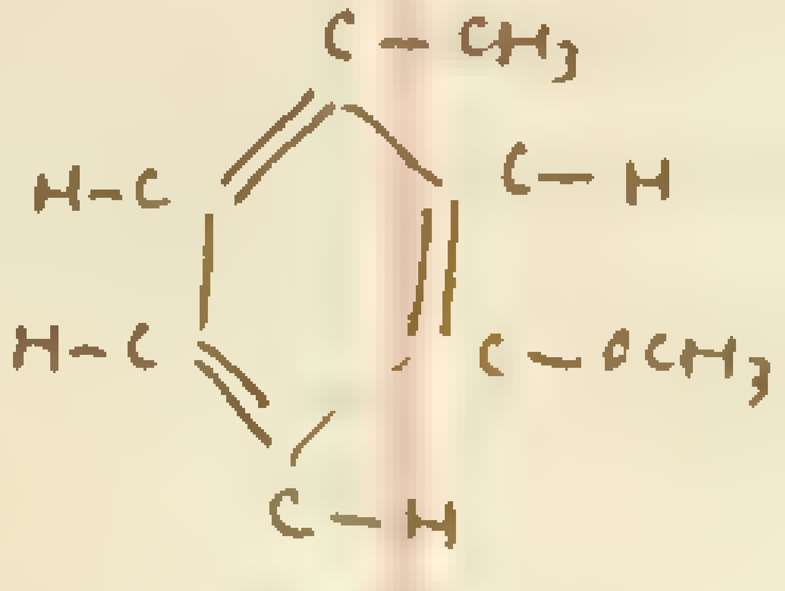
[illegible] chemical composition [illegible]
[illegible] Riechstoff [illegible] chemical construction [illegible] molecule arrangement [illegible]

[illegible] M + B, Anth + Nev. [illegible]

2. 人間ト[illegible] ~~[illegible]~~ composition [illegible]
構造式ノ相違[illegible]（例 Parakresolmethyläther ト meta）



para



meta.

3. 実験ニ使ハレ[illegible] Pressureduft（[illegible]）ト Verwechslungsduft [illegible] Dr. [illegible] [illegible] [illegible] Isobutylb. ト Salicyl.）

### IX. Die biologische Bedeutung des Blütenduftes.

花ノ[illegible]（Blumengäste. [illegible]）[illegible] Lockmittel [illegible] Lockmittel [illegible]（Nahrungs[illegible] [illegible] distance [illegible]（Merkzeichen）[illegible]

### X. Pressure auf Lysol, Schwefelkohlenstoff, Skatol u. Patchouliöl.

~~[illegible]~~ Ein Beitrag zur Psychologie der Biene.

[illegible] Bee [illegible]

[illegible] bee [illegible] negative [illegible] bee [illegible] bee [illegible] intelligence [illegible] instinct [illegible]

2 Lebende Blüten.

1 Duft von phlox paniculata 2. " Reseda odorata.

3. " narcissus poeticus.

[illegible] wohlriechende Öle

4 cassie ätherisch 5. jasmin b. 6. orangenb.

7. Resedab. 8 Tuberosenb. 9 Cedratöl

10 citronellöl 11. Fenchelöl, bitter 12. " , süss.

13 geranium öl, grasse 14 " , Reunion.

15 [illegible] 16. Ingaranöl, wild

17 pfefferminzöl 18. pomerangenschalenöl

19 Sternanisöl 20. Verbena öl.

21. isolierte Riechstoff.

21 amylacetat

22 anthranilsäure, methylester

23 [illegible]-Bromstyrol

24 Lysol

25 methylheptenon

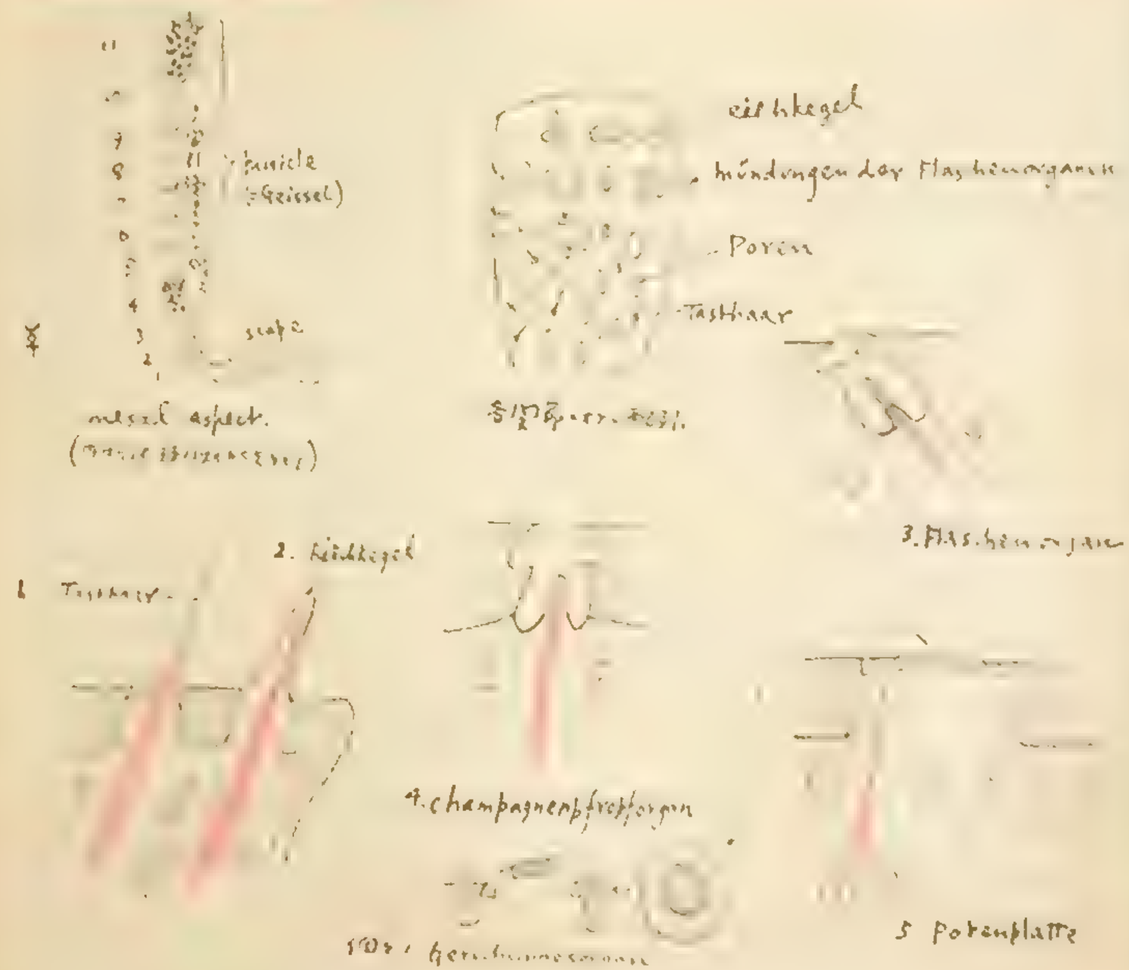
26 nerbanol

27 nerolin 28. parakresol methyläter.

Feb. 25.
15 ½ blank

Frisch [illegible] honeybee [illegible] 1921. Frisch. Über den Sitz des Geruchssinnes bei Insekten. Zool. Jahrb.

[illegible] Inquilinen [illegible] antennae [illegible] antennae [illegible] normal [illegible] antennae [illegible] Inquilinen [illegible] abnormal condition [illegible]



1. 雄蝶ノアル種ニテハ両方ノ antenna ヲ切除シ、雌ノ有無ニ関シ、雄ノ有無ニ関シ、
ト共ニ雄蝶ノ場合ニ於テ（後ノ方ニ述ベル）、雌ノ場合ニテハ雄ノ antenna ヲ切除スル
前ニ於ケル雄ノ誘引ノ有無ヲ調ベタ。 ∴ operation ニ依ル abnormality ニ於テ Geruchsinnes organ
ノ損傷ヲ来ス。

2. 雄ノ一方ノ antenna ヲ切除スルト、残リノ方ノ基部ノ方ニ於テ、
ヒトツノ Geruchsinnes organ ガ存在スル。 ∴ 雄ノ一方ノ antenna ハ一方ノ
organ ノ存在ニ基ク。

3. antenna ノ scape トカラ出ル三ツノ funicle No.1,2,3 ノ内ノ一ツノ funicle ノ基部ニ
Geruchsinnes organ ガ存ス。 ∴ 雄ノ antenna ニ於テハ
funicle ノ数ノ一ツ少ナイ。 (i.e. No.4 of funicle ハナシ) 此ノ organ ハ duft ノ識別ニ関シ
ノミ有効ナル organ ノ主体ニ ∴ 此ノ organ ハ duft ノ感覚器 ∴ Lee ノ Geruchsinn ハ此
antenna ノ organ ト推定ニ難クナイ。

4. 雄蝶ノ場合ニ於テハ Lee ノ言フ scapere ノ内ノ14ヶ所ノ duft
ノ識別ニ関シ、特ノ雄ノ場合ニ於テハ 16 ヶ所ノ Geruchsinn ヲ有ス。 ∴ 此ノ organ ハ duft ノ識別ニ関シ
ノミ有効ナル organ ノ主体ニ

雄ノ場合ニ於テハ 此ノ Geruchsinn ハ antenna ニ存ス。 ∴ 此ノ organ ハ sperrsaft ノ
識別ニ関シ ∴ 雄ノ場合ニ於テハ 此ノ organ ハ duft ノ識別ニ関シ

2segment ノ部ニ存スル Riech kögel ヲ lost スルト (Rösel ノ言フ organ ヲ失フ)
此ノ organ ハ Tastharen ノ contact Flaschen ニ基ク。 poren ハ此ノ Geruchsinn ヲ有シ
ノミ有効ナル organ ノ主体ニ

1. nerve end ノ structure ノ Hymenopteren ニ於ケル
ノ如キ特ニ此ノ organ ノ host ニ pollen poren ガ存スレバ 花粉ノ識別ニ
ナル。

## Minnich ノ実験

Minnich, D.E. 1924. The olfactory sense of the cabbage butterfly, Pieris rapae Linn, an experimental study. J. Expt. Zool. Vol.39. no.2: 379–396.

**method**

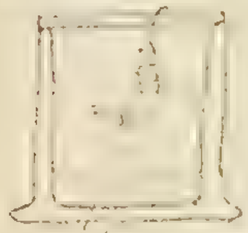


Table juice (commercial)

○ノ実験ハ主ニ嗅覚ニカヲイレ 花ノ汁ガ proboscis ノハシヲ刺ス ノミナラズ

一方ハ reaction ナシ no. reaction ; 一

2 proboscis 浸ノミ ノミ +100% (i.e.1) weighted response

〃 半分 〃 50% (i.e.0.5)

15分後ニ再度ヤッテ 100% ヲイッテモ 他ノヒトツノ standelize ヤ 対照ヤッテ 之ヲ実験ニ伴フ。

Table

| | | before operation | | | | | after operation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| expt. | no. of butterflies | total no. test | total no. resp | weighted resp. | % resp. | operation | total no. exp | tot. weig resp | % resp | D-H | (D-H)/5 | |
| 2 antennae eliminated | 5♂+5♀ | 40 | 40 | 40 | 100 | vaselined | 40 | 17 | 12.5 | 31 | 69 | 64 |
| | 5+5 | 40 | 40 | 40 | 100 | paraffined | 40 | 21 | 20 | 50 | 50 | 45 |
| | 5+5 | 40 | 40 | 40 | 100 | amputated | 40 | 9 | 7 | 18 | 82 | 77 |
| 1 antennae eliminated | 5+6 | 44 | 44 | 44 | 100 | vaselined | 44 | 39 | 37 | 88 | 16 | 11 |
| | 5+5 | 40 | 40 | 40 | 100 | paraffined | 40 | 37 | 36.5 | 91 | 9 | 4 |
| | 5+8 | 52 | 52 | 52 | 100 | amputated | 52 | 51 | 48.5 | 93 | 7 | 2 |
| | | | | | D | | | | | H | | |

D-H = decrease in % of response. ~~(D-H)-5~~

(D-H)/5 = 〃 〃 〃 〃 due to operation.

{ operation ニヨッテ生ジタル減少 % ノ平均値 next p. 55

successive removal of antennae.

table.

| | no. | 1st set of trials. T.no. T | T.no. Y. | T.W.R. | %r | operation | 2nd set of trials T.no. T. | T.no. Y. | T.W.R. | %r. | D-H | D-H-5 | operation | 3rd set of Trials. T.no. T. | T.no R | T.W.R. | %r | D-L | (D-L)-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12♂+12♀ | 88 | 88 | 88 | 100 | 1 ant. amputated | 88 | 82 | 78.5 | 89 | 11 | 6 | remaining antenna removed | 88 | 50 | 44.5 | 49 | 53 | 52 |
| control | 11+11 | 88 | 88 | 88 | 100 | no. op. | 88 | 84 | 83.5 | 95 | 5* | | no. op. | 88 | 88 | 87.5 | 99 | 1* | |
| | | | | | D | | | | | H | | | | | | | L | | |

D-H* D-L* = normal decrease in % of response.

conclusion

1. Piens rapae の雌雄共に対する proboscis の感覚器は嗅覚器である
2. 特に雄の場合は mechanical stimulation に対する感覚器を兼ねている.
3. 一方 antennae を除去する方が嗅覚を奪ひ%が減ずる
4. 即ち olfactory space の作用は減ずる 平均 58%
5. 次に antennae の一部 (antenna 全部の約 1/3 の部分) 即ち olfactory organ の一部を除去すると (antenna 全部の場合と同様に life control に比べ差異なしとなる)
6. Piens の雄の antennae 第3節 最も大きな olfactory area である. 即ち 此部の感覚器 olfactory organ を有する.
7. Piens の場合 触角の先端 1/3 の部分 olfactory area である. (約 50% 程度 [illegible] 方が嗅覚器である)

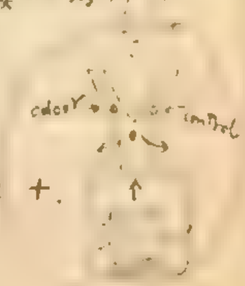
[illegible] Indco の研究について

McIndoo, 1926. An Insect Olfactometer. J. Economic Ent. vol. 19, no. 3 545-571.

colorado potato beetle が [illegible] 2 normal plant の [illegible] 刺激に対する

| | |
|---|---|
| 1 Emanations of living host plant | +76.7% |
| 2 water extracts of potato foliage | + |
| 3 steam distillate " " | + |
| 4 water extracts & steam distillates of foliage of other solanaceae | + |

[illegible] olfactometer [illegible]




—The End—.

entomology Prof. YUASA 1926

[illegible] — ology as illustrated by animals
Jour. Morph. Ecol. III,

[illegible] — Physiological Animal Geography.
Jour. Morph. XXII

[illegible] Ecological Succession. I.

I. Biol. Bull. XXI [illegible]
II. XXI. [illegible]–51
III. XXII 1–38
IV. XXII. 59–79
V. XXIII. 331–370

[illegible] — Succession in a Sphagnum Bog.
Proc. Iowa Acad. Nat. Sci. Phila, 1907
[illegible]



Dec., 1926.

1. zoology: systematic: taxonomy: ecology: classification upon a physiological basis with particular reference to relations to environment. p. 332
2. (Ekl) ecological study: Warming's work: publication, 1831 = [illegible] p. 332
3. ecology: mimicry, structural adaptation etc: evolutionary speculation: [illegible] a branch of general physiology which deals with the organism as a whole, with its general processes, as distinguished from more special physiology of organs; i.e. physiological life histories — behavior in relation to the condition of existence, ~~which is dependent upon rate of metabolism~~ but primarily in nature. pp. 313–314
4. ecological optimum: maximum no. of individuals: study of modifiability of behavior — or adjustment of behavior to the conditions p. 335
5. ecological classification is based upon differences and similarities of 'movements' (meaning of behavior, habitat etc, latter) or general physiological characters. not selections of habitat is depending upon more or less 'innate behavior', that is not [illegible] understood. p. 336
6. environment, [illegible] study of the effects of the various factors upon the organisms concerned: [illegible] — [illegible] reaction: some community exists quite equally [illegible] — [illegible] effect [illegible] much emphasized [illegible]. [illegible] specificity of behavior [illegible] ecology: [illegible] ecological specificity? pp. 339–359

ecology: [illegible] structural adaptation :— vertical aspect in ecological classification.

? Structural adaptation [illegible] stratum (level of habitat) [illegible]

ecological: life mode? [illegible] genera [illegible] higher or lower structural adaptation (Hemiptera, piercing modified mouth-parts) [illegible] detail [illegible] factor [illegible]. i.e. taxonomic group, adaptive [illegible] taxonomic differentiation [illegible] index [illegible] ecological relation [illegible] (ecology [illegible] structure [illegible] organism: physiology [illegible] activity [illegible] [illegible] relation

Entomology Prof. Summers 1926

habitat preference & life history — habitat preference & structural adaptation — p.365

to

control

premate primarily — physical conditions — [illegible] — physiological relations [illegible]

[illegible] — ecological barriers — harmonic — structural character — [illegible] relations [illegible])

[illegible] note not for habitat

horizontal direct of ecological classification — Habitat

8 ecological succession — physiographic conditions (physical conditions change [illegible])

— biological conditions (organisms [illegible]) — continuous (continue responsible [illegible]) — [illegible]

— climatic area — [illegible] — ecological succession [illegible] p.344

[illegible] — ecological succession relating to physiographic processes — peneplanation.

9. succession proceeds until conditions are such as to be favorable to organisms

[illegible] immune to their own effects upon their own environment; Ecological

[illegible] all moves types toward its physiological types of organisms

[illegible] adjusted to climatic conditions of the area; its vegetation and therefore the

[illegible] animal habitats of its local conditions are now converging toward a

climatic [illegible] immune to its own excretory products. This has been called the

[illegible] p.347

second primary and secondary conditions and communities.

10. secondary communities are those produced by cultivation or other activities

of man, and are maintained only by cultivation, reverting to the primary types

as soon as the cultivation ceases. In the forested area, some forest animals live

after the clearing process is finished in fence corners, under stones, etc. From the

point of view of ecological generalization, data on distribution under agricultural

conditions [illegible] or questionable value. p.350

[illegible] — [illegible]

11 moves — groups of organisms in full agreement as to physiological life histories:

constitutes usually belong to single species but may include more.**

consocies — groups of moves usually dominated by one or two of the moves

and in relative agreement as to physiological life [illegible] (such as main features

of habitat preference, time of reproduction, reactions to physical factors, etc).

** [illegible] may have several moves; different species may have identical moves.

— (p.[illegible])

strata — groups of consocies occupying the ~~[illegible]~~ recognizable vertical divisions of a uniform area; strata are in agreement as to materials for abode and general physical conditions, but in less detail than consocies which constitute them: migration of animals makes a rigid classification difficult.

association — groups of strata uniform over a considerable area: it depends upon the migration of the same individual and the same moves at different times or periods of their life histories; such migration is far less frequent than from one association to another; therefore the majority of moves, consocies, and strata are different in different associations.

formation — groups of associations: it differs from one another in all the strata, the common species to two formations is usually small; migrations from one to another relatively rare.

extensive or climatic formation — groups of formations including all clearly influenced by a given climate and by topographic age of a large area (such as ~~[illegible]~~ deciduous forest extensive formation). pp.350–359

Testing of ecological characters.

12. (1) by the measurement of reaction to all or several of the chief environmental factors under rigidly controlled conditions, with each factor accurately measured qualitatively and quantitatively, and with the measurements of speed or intensity of the reaction separately determined.

(2) by testing the reaction of the animals to a graded environmental complex of known constitution

(3) by putting the animals out into a graded series of natural environments selected with due reference to the species in question. notes.

summary by author.

1. Ecological or physiological classification of animals is based upon similarities and differences in physiological life histories, reactions to physical factors and general physiology

of [illegible] relations. pp. 333, 334.

2. There is an improvement behavior mores of a community due to (a) selection of habitat through innate tendencies and (b) modification of behavior, p. 336.

3. The [illegible] recognized specificities of behavior are of little significance in ecological classification. p. 335.

4. Adaptation is of questionable significance in ecology; the most common adaptations are made up to climate or mode of food getting. p. 340.

5. Animal community [illegible] units of greater magnitude are made up of those of lesser magnitude. The physiological improvement in those of greater magnitude is less close than in those of lesser. pp. 354-56

6. Animal communities are physiologically and genetically (succession) related and their practical [illegible] is determined by the genesis of the environment which is usually anti-agnostic and converging, p. 35)

7. The relations of ecology to the phenomena of genetics and of adaptation, are not [illegible]; no [illegible] are apparent but actual relations are experimentally determinable.


Adams, C.C. 1913. A Handbook for Students of Animal Ecology (outline). Ecological Studies of Prairie and Forest (summary) Ill. St. Ac. Trans., Vol. III., 1911, p. 33.

Lewis H.C. 1911 A Text Book of Botany. Vol. II., Ecology. N.Y.

[illegible] 1903 Plant Geography upon a Physiological Basis. Oxford.

Shelford, V.E. 1911 Physiological Animal Geography. Jr. of Morph. (Whitman Vol.), Vol. XXII, pp 551-618

Warming, E. 1909 Ecology of Plants. An Introduction to the Study of Plant Communities. Oxford. (Translation by Percy Groom)


as a result animals select their habitats. (Habitat Preference) ... p. 21

Dec. 21.

There are various facts pointing to a difference in the animals attracting trees differently located with respect to other trees; trees standing alone in open pastures probably have a very different fauna from trees trees of the same species growing in the woods. ... p. 16.

Irritability — the property by virtue of which the force attributed to living substance is not in proportion to the force resulting. ... p. 22.

we see that ~~the~~ function and structure are mutually interactive and mutually interrelated, (p. 23) but one of the reasons for the inadvisability of attempting to ~~organizing~~ organize ecology on the basis of structure lies in the fact the structural changes resulting from stimulation by the environment are rarely of advantage or disadvantage to the animal, and further that the structure of motile animal, is not readily modified by the environment. ... p. 25

Spontaneous activity — movement of animals without any external stimulation: organism is naturally ~~at~~ active; accordingly, movement may possibly take place as a manifestation of the released energy inside to animal, or of disturbances and changes in the organism which are not directly initiated by the environment. (growth, reproduction, death, etc.) ... p. 27.

: The animal moves, but not select the place (or condition?) where its internal processes are no longer interfered with by the stimulus.* ~~spontaneous~~ Spontaneous activity differs at different physiological states, therefore causing modifability of behavior and change of reaction. ... p. 29

Def. stimulus — any change in the external condition sufficient to alter the internal processes of organism.

reaction — visible movement of the organism or other phenomena resulting from stimulation. a) cessation of movement · retardation b) initiation of movement · acceleration. c) change in kind or direction of movement. ... p.23

most important activities of animals — the activity which determines the range of conditions under which a species will be successful is the activity which takes place ~~wh~~ within the narrowest limits: that is usually the breeding activity. ... p.31

community — a given environmental complex is selected by a number of species: all of the animals of given habitat constitute what is known as an animal community (all the life of plant and animal — is a 'biota') : ~~when~~ not it follows that there is often a certain physiological or ecological similarity in the species which select the same or similar habitats: When not ecologically similar, animals living in the same or similar habitats are usually 'ecologically equivalent' i.e. they meet the same conditions in different ways.

The agreement of all the animals of the community in their reactions to the p[illegible] encountered is due (a) to the selection of habitat through innate behavior and (b) to the adjustment of behavior to the conditions (through the effects of physical factors and through formation of habitats and associations) ... p.33.

Dec. 21, 1926.

important of habitat study — the study and analysis of the ~~[illegible]~~ habitat is a necessity as soon as the selection of habitat and ~~[illegible]~~ adjustment of behavior and physiological makeup to the environment are shown to be general facts. p35

The relations of the animals which make up communities are relations of life histories: there are seasonal succession, etc. ... p.35.

environmental complexes — most important environmental factors — water, atmospheric moisture, light, temperature, pressure, oxygen, carbon dioxide, nitrogen, food, enemies, materials ~~used in~~ or abodes, etc. ... p.42.

physiographic history and feature are important to animal ecologist — p.44.

— ground-water table level, slope relation to the sun, amount of surface soil, densenesses of vegetation, etc. p.44.

stations — the points selected for study are called stations: stations are subdivided on the basis of plant and animal habitats into subdivisions: subdivisions may represent either formations or divisions of formations. ... p.51.

* per cent of weight.

Dec. 27. 1926. from Shelford, 1913

1. Materials for abode: The solid substances in and upon which animals live.

2. conditions of existence of land animals.

Soil 1. texture. Particular animals prefer soils of particular texture.

2. water. most subterranean animals are submerged in water during rains: at other times the amount of water* in the soil, determined by their relation to the water table, by the character of the soil, etc; it is not proportional to the capacity of the soil to retain or give up moisture; this is expressed in terms of the moisture equivalent - the percentage of water which it can retain in opposition to a centrifugal force 1000 times that of gravity: again the roots of plants gradually reduce the water content; (the wilting coefficient of a soil is the moisture content (in percentage of dry weight) at the time when the fibres of the plant growing in the soils first undergo a permanent reduction in moisture content, as a result of a deficiency of moisture supply. The moisture equivalent of a soil is 1.54 times its wilting coefficient for wheat, used as a standard plant.)¶: A soil gives water to or takes water from the body of a subterranean animal in proportion to the availability of water in the soil in question; the amount of available water increases with depth. ..Pp. 157 158

3. Temperature. decreasing with depth and with increasing moisture.

4. plants and animals. If excretory products ever accumulate in any quantity, they probably have a detrimental effect, especially upon the animals which produce them. Humus accumulation alters soil aeration. ...159.

Atmosphere in light.

1. light – many animals show diurnal migration due to changes ... p. 160

2. temperature — the temperature of the air varies with light. ...

3. pressure. ...

4. humidity atmospheric humidity is very important to animals and determines the sensible temperature and rate of evaporation to a large degree. ...

5. composition of the atmosphere — carbon dioxide is believed by some physiologists to be a necessary stimulus to the brain to cause all respiratory movements. It is believed by some that mountain sickness is due to decreased carbon dioxide pressure. ...

6. currents — currents of wind are important in scattering animals and in affecting the rate of evaporation from their bodies. Some animals take up definite position with reference to wind (anemotaxis). ...

7. atmospheric electricity — little known. ... p. 161.

8. combinations or complexes of factors.

index of for plants by De Candolle — mean daily temperature above 6°C. as the starting-point of plant activity. ...

evaporation as an index of physical conditions — the total effect of air temperature, pressure, relative humidity, and average wind velocity upon a free water surface in the shade or in the sun is expressed by the amount of water evaporated: it is not, however to be expected that it will hold good for all the factors under all climatic conditions, and for this reason, records of light, temperature, pressure, carbon dioxide, etc., should be made.

Dec. 28.

from Shelford, 1913

General discussion.

Application of the laws governing animal activities to World and regional problems.

1. Reactions to single factors. By the results of experiments which are attempts to keep the environment normal, except for one factor, these have demonstrated that animals are capable of responding to the action of a single stimulus. ... p. 300.

2. law of toleration; ecological optimum + distribution ... 1912/4. The success of a species, its numbers, sometimes its size, etc. are determined largely by the degree of deviation of a single factor (or factors) from the range of optimum of the species. ... p. 302 ff.

3. application of the law of toleration to distribution the locality or region of optimum, or the locality or region in which the animal is most nearly in physiological equilibrium, is called the habitat (ecological optimum) when it refers to ecological or local distribution, and the center of distribution when it refers to extensive areas. The geographic or local range of any species is limited by the fluctuation of a single factor (or factors) beyond the limit tolerated by that species: the distribution area of a species is the distribution of the complete environmental complex in which it can live: every study of animal behavior which is related to measured physical factors or to natural environments is directly related to problems of distribution. ... pp. 303 304.

agreement between plants and animals.

4. organisms may be divided on the basis of their ability to move about, into sessile or fixed, and motile forms: logically, ecology cannot be divided into plant and animal ecology, but it may be divided into the ecology of sessile and motile organisms: activity activities of motile animals correspond roughly to the growth form phenomena in sessile plants or form changes as 'plant response' and behavior or activity changes as 'animal change'.

5. The distributions of plant and animal species are not always correlated; but temporarily out of adjustment. Plant and animal communities may be said to be in full agreement when the growth form of each stratum of the plant community is correlated with the conditions selected by the animals of that stratum. ... pp. 307–308.

correspondence of communities of different parts of the world.

6. The vegetation of different parts of the world which have similar climates is similar and the plants though usually belonging to different taxonomic groups are similar in growth, form and appearance. Correspondence and similarity of vegetation is not limited to the climatic or extensive formations, but applies also to strictly local situations wherever the physical conditions are similar. On the animal side we have less trustworthy evidence of similarity or correspondence. ... p. 313.

We classify the responses and changes in animals as evolution, modification by the environment, behavior, and physiological response. Are not all these, after all, but different expressions of the same or similar processes? Future investigations must answer this question. ... p. 318.

instrument for measuring the evaporation — porous cup atmometer, devised by Livingston ... p. 162.

The evaporating power of the air varies in different situations: it is usually greater at the higher levels of a habitat (also higher temperature at higher levels; both due largely to vegetation). ... p. 164

4. division into strata: a) subterranean-ground stratum {made up of algae, mosses, immediately above the surface of the ground.
b) field stratum .. grasses and herbs
c) shrub stratum .. shrubs taller than the herbaceous vegetation
d) tree stratum. ... p. 165.


Tower, W.S. Scientific Geography: the Relation of Its Content to Its Subdivisions. Bull. Am. Geog. Soc., XLII, 801. 1910.

Seton, E. Thompson. Life Histories of Northern Animals. New York 1909.

Cohnheim, O. Physiologie des Alpinismus. II. Ergebnisse der Physiologie, Bd. 12. 1912.

Line bet. land and water. marsh, swamp; temporary, permanent.

(ordinary
(spring marsh.

(bare bottom → sedge → shrub
(~~sedge~~ bulrush

↓

willow, ash, maple.

↓

tamarack
(about deep lake)

← elm ← ash, maple.

← basswood

Review Questions in Advanced Entomology.
February, 1927.

by Prof. Yuwasa.

Systematic:

1. What are the contributions of Linne to taxonomy of insects?
2. The same for Handlirsch?
3. What is species?

Insect Behavior:

4. What are the methods of collecting data concerning behavior mentioned by Washburn? Discuss the difficulties, merits and defects of each.
5. Explain Loeb's theory of forced movements. What is the meaning of the bilateral symmetry according to this theory?
6. What are the principles mentioned by Prof. Kawamura in his paper on animal behavior? See: 生理学研究 第二巻 No. 1, 3, 12.

7. What is the structural basis of animal behavior?
8. Discuss the four ~~principle~~ principal nervous systems of insects.
9. Discuss the structure and function of the head ganglia.
10. The same for the thoraic and abdominal ganglia.
11. Who is Alexios Zawarzin? What are his chief contributions?

Lotisimulation:

12. Discuss the general features of insect death-feigning.
13. Discuss the sleep of insects.
14. Mention the name of several ~~investigators~~ investigators of "animal hypnosis."

Chemical Sense:

15. Discuss the gustatory sense of insects.
16. Explain the experiments and general conclusions of Minnich.
17. Discuss the olfactory sense of insects.
18. Explain the experiments and general conclusions of Frisch.
19. The same of Molndoo.
20. The same of Minnich.